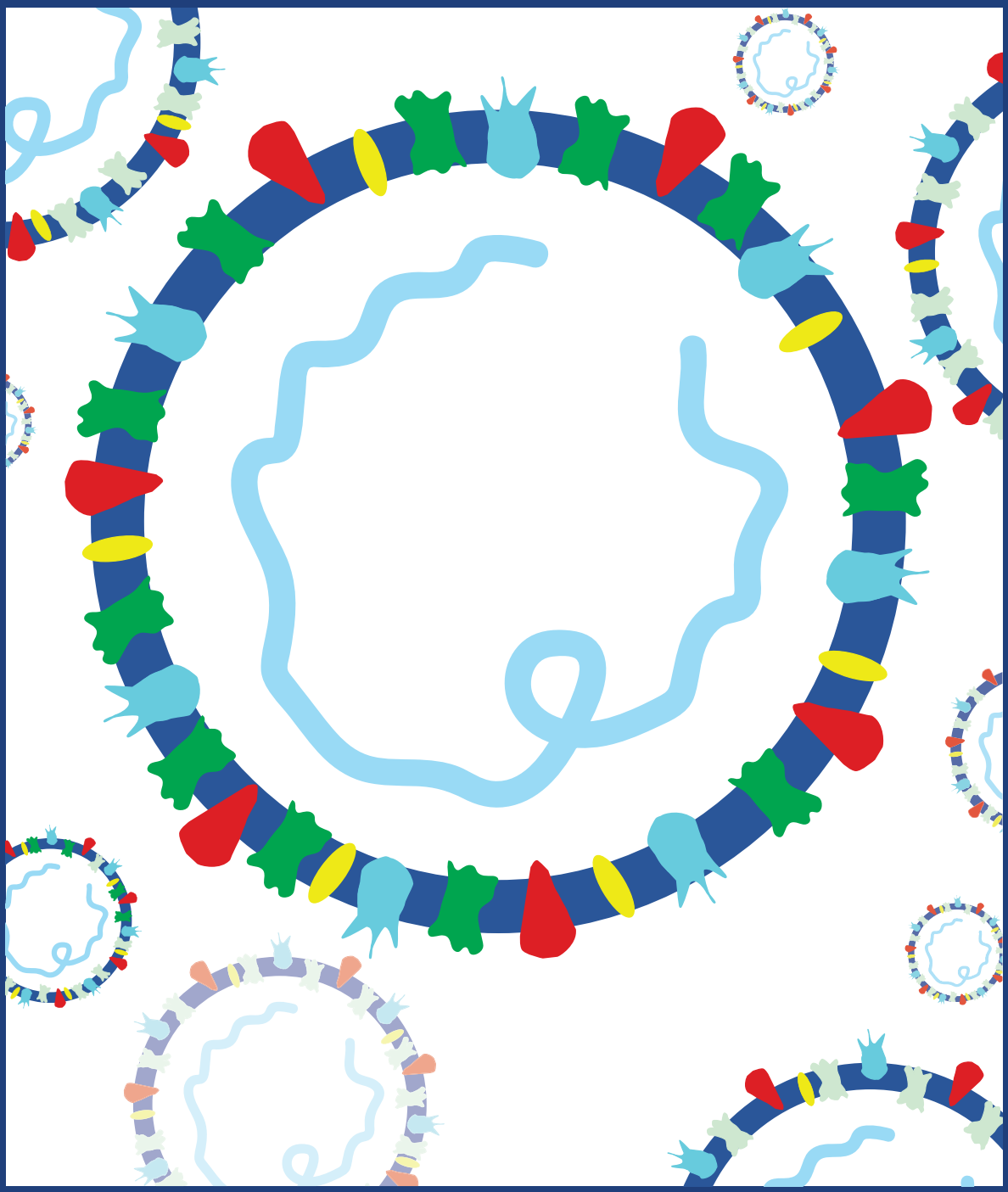
F. Graziani, R. Izzetti, L. Lardani, M.L. Biancarini, M. Gabriele

Dental Practice in the era of SARS-CoV-2 pandemic:

a checklist to enhance safety and good practice



EDIZIONI MARTINA

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a checklist to enhance safety and good practice

UNIVERSITÀ DI PISA

DEPARTMENT OF SURGICAL, MEDICAL AND MOLECULAR PATHOLOGY
AND CRITICAL CARE MEDICINE

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e-mail: info@edizionimartina.com www.edizionimartina.com
ISBN 978-88-7572-183-1

Finito di stampare nel mese di Giugno 2020
presso la Fotoincisa BICO
Via della Fisica 33 - San Lazzaro di Savena Bologna

L'immagine di copertina è stata creata da Lisa Lardani©

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Preamble

The rapid and sudden outbreak of the COVID-19 pandemic brought us to reconsider many of the solid certainties that we have been accustomed as health care practitioners. The nature of our profession allows us to deal with the unknown on a regular basis. It is nonetheless a unique feature, and most probably never existed before, the swift change of paradigms that we are witnessing daily during these unforgettable months.
Our group tried from the very first moment to deal with possible suggestions for clinical practice during these dire times. Our results have ultimately produced a sort of checklist that we believe it is our duty to share with colleagues worldwide. However, some caveats are important, and the following precautions need to be adopted:

- Our profession is risky due to the intimate closeness with unmasked patients. Thus, any professional must accept that there is a risk that cannot be nullified.
- In this book we do not describe guidelines nor recommendations, but a sum of suggestions deriving from the available knowledge and the clinical experience of the authors. Current evidence is still lacking proper randomized clinical trials.
- Please follow your government and ministry of health recommendations. These suggestions should not in anyway interfere with the former.
- The suggestions may change swiftly as this is the nature of the ongoing clinical knowledge.

Normally, in reading such comments we would be tempted to dismiss the book or, worse, being hit by an attack of grey pessimism. However, we must remind the reader that in no time in history the world has been better prepared to face a global challenge like this one. These are complex and difficult days, but soon humanity will prove its value as treatments and vaccines will arrive at unknown speed for the contemporary, now former, medical science.
We are facing history and we have no doubt that the medical and the dental community are ready for that.

Filippo Graziani
Rossana Izzetti
Lisa Lardani
Maria Lucrezia Biancarini
Mario Gabriele

Table of Contents

The Checklist and the procedures

F. Graziani, R. Izzetti, L. Lardani, M.L. Biancarini

PHASE I

PRE-TRIAGE

ACTION 1: PHONE TRIAGE

WHO	WHERE	WHAT
NON-CLINICAL STAFF	PATIENT AT HOME	PHONE TRIAGE

Greetings and investigate

✓ Do you have pain or any need that require urgent treatment? YES NO

Q1 Are you currently affected by Covid-19? YES NO

Q2 Have you previously been infected by COVID-19? If yes, have you been declared clinically healed from COVID-19 or with nasopharyngeal swab? YES NO

Q3 Do you currently have any of the following symptoms, such as fever, cough, respiratory difficulty, conjunctivitis, diarrhea, flu, loss/difficulty of taste, loss/difficulty of smell? YES NO

Q4 Did you have in the last month any of the following symptoms, such as fever, cough, respiratory difficulty, conjunctivitis, diarrhea, flu, loss/difficulty of taste, loss/difficulty of smell? YES NO

Q5 Did you have any contact with SARS-CoV-2–infected patients in the last month? YES NO

Q6 Did you have any contact with subjects placed in quarantine, either self-disposed or organized by the health authorities, in the last month? YES NO

Q7 Are you a health care worker? Or is your job exposing you to a large number of people/close contact to people? YES NO

✓ **IF ANSWERS "NO" to Q1**

If answers "YES" to any of Q2, Q4, Q5, Q6, Q7 please reschedule triage after 2 weeks

If answers "YES" to Q3 and the healing is through swab, please proceed to ACTION 2

If all answers are "NO" please proceed to ACTION 2

If answers "YES" to Q3 and the healing is through clinical diagnosis, please invite to swab or postpone

If answers "YES" to Q8 evaluate according to situation

✓ **IF ANSWERS "YES" to Q1**

If answers "YES" to any of Q2, Q4, Q5 and present urgent need of treatment please refer to HUB-COVID/HOSPITAL

If answers "YES" to Q6 ot Q8 evaluate according to situation

✓ At the end of the telephone call, have you explained the new procedures and the triage setting that the patient will find at the arrival to the practice? YES NO

✓ Have you asked the patient to wear a mask when arriving at the practice? YES NO

PHASE I

PRE-TRIAGE

ACTION 2: AGENDA SET UP

WHO	WHERE	WHAT
NON-CLINICAL STAFF	DENTAL PRACTICE	AGENDA SET-UP

- ✓ Have you planned to avoid the contemporary presence of more than 2 patients in the waiting room? YES NO
- ✓ Have you scheduled appointments to minimize possible contact among patients leaving/entering the waiting room? YES NO
- ✓ Have you scheduled aerosol-generating procedures as the last appointments of the day? YES NO
- ✓ Have you discouraged, when possible, the presence of accompanying people (except for pediatric patients, people with special needs, elderly patients)? YES NO
- ✓ Have you optimized patient presence in the practice by enahncing the number of procedures per appointment? YES NO
- ✓ **IF ALL ANSWERS ARE "YES" PLEASE PROCEED TO ACTION 3**

ACTION 3: SELF-CERTIFICATION

WHO	WHERE	WHAT
CLINICAL AND NON-CLINICAL STAFF	DENTAL PRACTICE	SELF-CERTIFICATION

- ✓ Have all the team members signed a certification reporting:
  - The absence of symptoms suggestive for COVID-19 YES NO
  - The absence of contacts with infected/at risk subjects YES NO
  - The absence of contacts with quarantined subjects YES NO

PHASE II — UPON PATIENT ARRIVAL

ACTION 4: PRACTICE SET-UP

WHO: NON-CLINICAL STAFF | **WHERE:** DENTAL PRACTICE | **WHAT:** RECEPTION

- ✓ Have you provided the following PPE for non-clinical staff?
  - Mask — YES / NO
  - Gloves — YES / NO
  - Goggles — YES / NO

WHO: NON-CLINICAL STAFF | **WHERE:** DENTAL PRACTICE | **WHAT:** RECEPTION DESK SET-UP

- ✓ Have you disposed a screen divider on the reception desk? — YES / NO
- ✓ Have you marked 1 m distance from the desk using tape on the floor? — YES / NO
- ✓ Have you disinfected ALL the surfaces with 0.1% sodium hypoclorite or 70% isopropyl alcohol? — YES / NO
- ✓ Have you disposed the following supplies at healthcare facility entrances, waiting rooms, and patient check-ins?
  - Alcohol-based hand rub with 60-95% alcohol — YES / NO
  - Tissues — YES / NO
  - Open bin for disposals — YES / NO
  - Surgical masks — YES / NO

WHO: NON-CLINICAL STAFF | **WHERE:** DENTAL PRACTICE | **WHAT:** WAITING ROOM-SET-UP

- ✓ Have you provided adequate ventilation of the waiting room? — YES / NO
- ✓ Have you removed all the objects which could favour cross-infection? — YES / NO
  - Journals/magazines/reading materials — YES / NO
  - Toys/sheets/pencils — YES / NO
- ✓ Have you left 1m of distance among seats? — YES / NO
- ✓ Have you provided infographics for patient instruction? — YES / NO

PHASE II — UPON PATIENT ARRIVAL

ACTION 5: PATIENT ARRIVAL AT THE PRACTICE

WHO — NON-CLINICAL STAFF | **WHERE** — NON-CLINICAL AREA | **WHAT** — PATIENT RECEPTION

- ✓ Have you provided masks for patients if they don't wear it? YES / NO
- ✓ Have you recorded patient temperature through contactless thermometer? YES / NO
- ✓ Have you removed and stored patient's belongings (coats/bags/telephone)? YES / NO
- ✓ Has the patient performed hand sanification? YES / NO
- ✓ Has the patient signed a written consent form to undergo the triage questionnaire? YES / NO

WHO — NON-CLINICAL STAFF | **WHERE** — NON-CLINICAL AREA | **WHAT** — IN OFFICE TRIAGE

HAVE YOU ASKED THE PATIENT THE FOLLOWING QUESTIONS ON ARRIVING AT THE DENTAL PRACTICE?

- **Q1** Has anything changed since the triage at the telephone? YES / NO
- **Q2** Are you currently affected by COVID-19? YES / NO
- **Q3** Have you previously been infected by COVID-19? If yes, have you been declared clinically healed from COVID-19 or with nasopharyngeal swab? YES / NO
- **Q4** Do you currently have any of the following symptoms, such as fever, cough, respiratory difficulty, conjunctivitis, diarrhea, flu, loss/difficulty of taste, loss/difficulty of smell? YES / NO
- **Q5** Did you have in the last month any of the following symptoms, such as fever, cough, respiratory difficulty, conjunctivitis, diarrhea, flu, loss/difficulty of taste, loss/difficulty of smell? YES / NO
- **Q6** Did you have any contact with SARS-CoV-2–infected patients in the last month? YES / NO
- **Q7** Did you have any contact with subjects placed in quarantine, either self-disposed or organized by the health authorities, in the last month? YES / NO

IF TRIAGE IS NEGATIVE INVITE PATIENT TO TAKE A SEAT IN THE WAITING ROOM

WHO — NON-CLINICAL STAFF | **WHERE** — NON-CLINICAL AREA | **WHAT** — ACCOMPANYING PERSON

- ✓ Have you asked the accompanying person (if present) to wait outside the practice? YES / NO
- ✓ If the accompanying person enters the practice, have you performed the following procedures? YES / NO
  - Temperature recording YES / NO
  - Hand sanification YES / NO
  - Written consent form to undergo triage questionnaire YES / NO
  - Triage YES / NO

PHASE II — UPON PATIENT ARRIVAL

ACTION 6: PREPARATION OF THE CLINICAL AREA

WHO	WHERE	WHAT
CLINICAL STAFF	CLINICAL AREA	CLINICAL ROOM PREPARATION

- ✓ Have you removed all unnecessary objects from the surfaces? YES NO
- ✓ Have you cleaned and disinfected all the surfaces of the room (use sodium hypochlorite 0.1 or 70% isopropyl alcohol or chloro-derivate solution)? YES NO
- ✓ Have you protected all the surfaces through disposable covers? YES NO
- ✓ Have you protected all auxiliary instruments (microscope, camera, X-ray, magnifying systems, telephone, computer, etc.)? YES NO
- ✓ Have you prepared in advance all the necessary materials and instruments for the treatment? YES NO

ACTION 7: CLINICAL STAFF PROTECTION

WHO	WHERE	WHAT
CLINICAL STAFF	CLINICAL AREA	CLINICAL STAFF PROTECTION

- ✓ Have you washed your hands for at least 60s or disinfected your hands with a 60% hydroalcoholic solution? YES NO
- ✓ Have you worn PPE in the following order?
  - Gloves YES NO
  - Gown YES NO
  - Cap YES NO
  - FFP2/FFP3 with no valve or FFP2/FFP3 with valve + surgical mask YES NO
  - Goggles and face shield YES NO
  - (second pair of gloves) YES NO

PHASE III

TREATMENT

ACTION 8: PATIENT PREPARATION

WHO	WHERE	WHAT
CLINICAL STAFF (DENTAL ASSISTANT)	CLINICAL AREA	PATIENT PREPARATION

- ✓ Did you provide shoe covers for the patient? YES NO
- ✓ Has the patient performed a mouth rinse or cotton roll soaking for pediatric patients prior to treatment beginning? YES NO

ACTION 9: TREATMENT MANAGEMENT

WHO	WHERE	WHAT
DENTAL PROFESSIONALS	CLINICAL AREA	TREATMENT MANAGEMENT

- ✓ Have you organized your treatment in order to limit/avoid the use of handpieces/ultrasonic instruments? YES NO
- ✓ If you have used handpieces, have you employed an internal decontaminating liquid in your system? YES NO
- ✓ Have you tried to manually instrument if possible? YES NO
- ✓ Have you worked with an assistant? YES NO
- ✓ Have you positioned the rubber dam if possible? YES NO
- ✓ Have you used a surgical aspiration system? YES NO

PHASE IV POST-TREATMENT MANAGEMENT

ACTION 10: PATIENT EXITING

WHO	WHERE	WHAT
NON-CLINICAL STAFF	NON-CLINICAL AREA	PATIENT EXITING TREATMENT AREA AND DENTAL PRACTICE

- ✓ Have you advised the patient to wear again the mask? YES NO
- ✓ Has the patient removed the shoe covers? YES NO
- ✓ Has the patient collected his/her belongings? YES NO
- ✓ Have you accompanied the patient outside the practice? YES NO

ACTION 11: CLINICAL AREA SANITIZATION

WHO	WHERE	WHAT
CLINICAL STAFF	CLINICAL AREA	INSTRUMENTS & MATERIALS MANAGEMENT

- ✓ Have you disposed all the single use materials in biohazard containers? YES NO
- ✓ Have you removed the contaminated instruments? YES NO
- ✓ Have you decontaminated, washed, and dried, disinfected and sterilized all the reusable materials? YES NO
- ✓ Have you cleaned, rinsed, dried and disinfected electromedical equipment (with chloro-derivate solution in a concentration ≥ 0.1% or 1000 ppm (parts per million) with contact time superior to 1 min)? YES NO
- ✓ Have you cleaned and sterilized the handpieces after each patient? YES NO

WHO	WHERE	WHAT
CLINICAL STAFF	CLINICAL AREA	VENTILATION

- ✓ Have you provided at least 10/15-minute air change after each patient? YES NO

WHO	WHERE	WHAT
CLINICAL STAFF	CLINICAL AREA	SURFACES DISINFECTION

- ✓ Have you removed all the disposable protections from the surfaces? YES NO
- ✓ Have you cleaned and disinfected all the surfaces? YES NO

ACTION 12: PPE REMOVAL

WHO	WHERE	WHAT
CLINICAL STAFF	CLINICAL AREA	PPE REMOVAL

- ✓ Have you removed the PPE in the following order?
  - Gown and gloves YES NO
  - Shield and goggles YES NO
  - FFP2/FFP3 and surgical masks YES NO
  - Cap YES NO
  - (second pair of gloves) YES NO
- ✓ Have you washed your hands or used hand sanitizer after removing all the PPE? YES NO

Coronaviruses and SARS-CoV-2

M.L. Biancarini, F. Graziani

Coronaviruses

Coronaviruses (CoVs) belong to the subfamily of the *Orthocoronavirinae*, family *Coronaviridae*, suborder *Cornidovirineae*, order *Nidovirales* and realm *Riboviria* (International Committee on Taxonomy of Viruses (ICTV), 2019).

ORDER	SUBORDER	FAMILY	SUBFAMILY
Nidovirales	Abnidovirineae		
	Arnidovirineae		
	Cornidovirineae	**Coronaviridae**	Letovirinae
			Orthocoronavirinae
	Mesnidovirineae		
	Monidovirineae		
	Nanidovirineae		
	Ronidovirineae		
	Tornidovirineae		

CoVs are single-stranded, positive-oriented RNA enveloped viruses. The envelope is characterized by a microscopic appearance resembling a crown due to the presence of spike glycoproteins (S), prompting the name "coronaviruses". All CoVs have 16 non-structural proteins and at least 4 structural proteins (spike: S; envelope: E; membrane: M; nucleocapsid: N proteins) (Su et al., 2016).

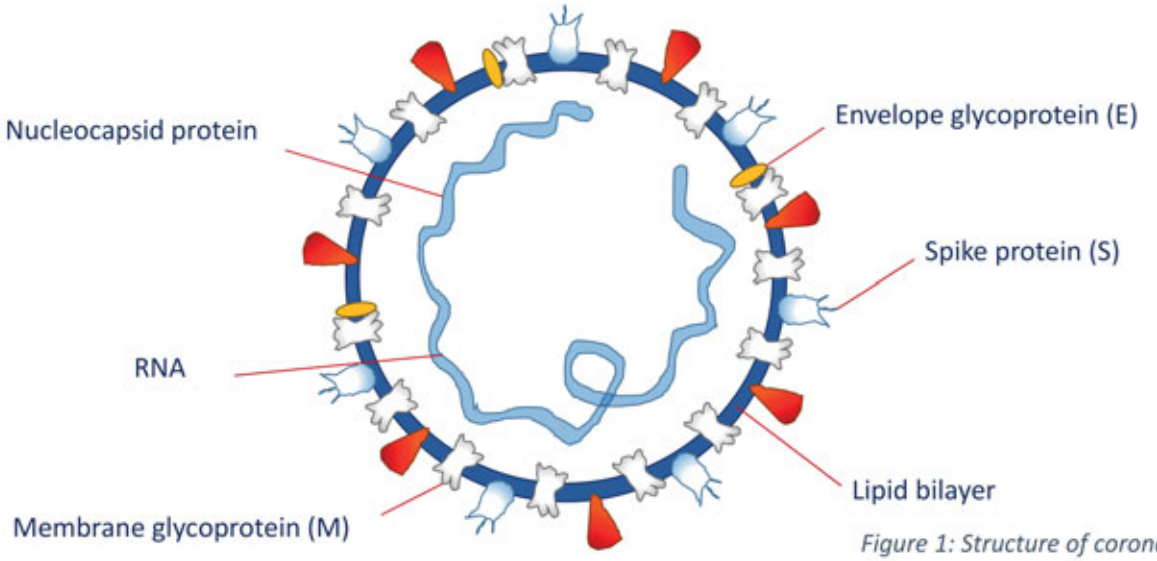


Figure 1: Structure of coronavirus

Spike glycoproteins are composed of two subunits, S1 and S2, which serve for adhesion to the host cell and for glycoproteins anchorage to the virus envelope respectively (Cascella et al., 2020). The presence of spike glycoproteins on the surface favors the adhesion to the host cell to transfer viral genetic material and facilitate subsequent replication in the host cell.
Following interactions between the S protein and its receptor, the virus gains access to the host cell cytosol, generally by fusion of the viral and cellular membranes. Subsequently, the viral RNA is released into the cytoplasm. All coronaviruses contain specific genes that encode proteins for viral replication, nucleocapsid, and spikes formation (Shereen et al., 2020).
After the replication and transcription of viral RNA, the viral structural proteins obtained from the transcription process concur to the formation of virions. Virions are then transported to the cell surface in vesicles and released by exocytosis.
The *Coronavirinae* can be classified into four genera, namely Alphacoronavirus (alphaCoV), Betacoronavirus (betaCoV), Deltacoronavirus (deltaCoV), and Gammacoronavirus (gammaCoV).

ORDER	SUBORDER	FAMILY	SUBFAMILY	GENUS
Nidovirales	Abnidovirineae			
	Arnidovirineae			
	Cornidovirineae	Coronaviridae	Letovirinae	
			Orthocoronavirinae	Alphacoronavirus
				Betacoronavirus
				Deltacoronavirus
				Gammacoronavirus
	Mesnidovirineae			
	Monidovirineae			
	Nanidovirineae			
	Ronidovirineae			
	Tornidovirineae			

AlphaCoVs and betaCoVs infect several mammalian species, including bats, rodents and humans, while gammaCoVs and deltaCoVs infect avian species.
The presence of CoVs in animals, such as camels, cattle, cats, and bats, causes various symptoms, and leads to the development of respiratory, enteric, hepatic, and neurological diseases. In some cases, albeit rarely, these viruses can evolve and infect humans, and then spread to the population (Gabutti et al., 2020).
Before 2019, six different CoVs had been identified in humans: two alphaCoVs (HCoV-229E and HCoV-NL63) and four betaCoVs (HCoV-OC43, HCoV-HKU1, SARS-CoV and MERS-CoV, also called HCoV-EMC/2012) (Corman et al., 2018).

However, some of human CoVs can be normally present in healthy subjects, and account for 5%-10% of acute respiratory infections (Chen et al., 2020). Common human alfaCoVs and betaCoVs (HCoV-OC43, HCoV-HKU1, HCoV-229E, and HCoV-NL63) are associated with mild clinical symptoms. Common cold and self-limiting upper respiratory infections can develop in immunocompetent individuals, while lower respiratory infections generally occur in immunocompromised subjects (Graat et al., 2003; Mackay et al., 2012).
However, before 2019, two specific human betaCoVs, SARS-CoV and MERS-CoV, were recognized responsible for severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS) respectively.
SARS-CoV and MERS-CoV caused epidemics characterized by variable clinical severity and high fatality rate, and presenting both with severe respiratory syndrome, related to viral infection of the lower airways, and extra-respiratory manifestations. SARS emerged in southern China in November 2002 and caused more than 8000 human infections and 774 deaths in 37 countries between 2002 and 2003, while MERS spread in Saudi Arabia in 2012 causing almost 2500 cases and 858 deaths (Gabutti et al., 2020).
SARS-CoV is believed to have been acquired by humans from carnivorous wild game such as civet cats, which in turn are thought to have acquired the virus from *Rhinolophid* bats (Ge et al., 2013; Yang et al., 2016).
In 2003, Ge et al. speculated that SARS-CoV or closely related viruses carried by bats may still be able to cause human disease after spillover infection (Ge et al., 2013).
Based on the hypothesis on origins of MERS- and SARS-CoV in bats, it has been proposed that all HCoVs may be of zoonotic origin, in particular from bats. However, there is still no reliable data on the evolutionary history of most HCoVs; only for HCoV-OC43 a zoonotic acquisition from ungulate livestock is widely accepted (Drexler et al., 2014).

SARS-CoV-2

In December 2019, the city of Wuhan in the Hubei region, China, registered the initial outbreak of an atypical form of pneumonia of unknown origin. In early January, a new coronavirus was identified as the responsible pathogen after isolation from the bronchial exudate samples, and interhuman transmission was confirmed. The coronavirus was initially named 2019-nCov by Chinese researchers (R. Lu et al., 2020). Shortly after, the 2019-nCoV was renamed SARS-CoV-2 according to the severe acute respiratory syndrome caused by the infection, by the Coronavirus Study Group (CSG) of the International Taxonomy Committee of Viruses (ICTV) (Gorbalenya et al., 2020).
The sudden and disruptive outbreak led to the WHO declaration of pandemic, and to date cases are registered in more than 200 countries worldwide.

SUBFAMILY	GENUS	SUBGENUS	SPECIES	INDIVIDUUM
Orthocoronavirinae	Alphacoronavirus			
	Betacoronavirus	Embecovirus		
		Hibecovirus		
		Merbecovirus	Hedgehog coronavirus 1	
			Middle East respiratory syndrome-related coronavirus	MERS-CoV
			Others	
		Nobecovirus		
		Sarbecovirus	Severe acute respiratory syndrome-related coronavirus	SARS-CoV
				SARS-CoV-2
				Others
	Deltacoronavirus			
	Gammacoronavirus			

SARS-CoV-2 probably evolved from a viral strain of zoonotic origin, specifically from Chinese horseshoe bats (*Rhinolophus sinicus*), similarly to SARS-CoV (Chan, Yuan, et al., 2020; R. Lu et al., 2020). This hypothesis is validated by the genetic structure of SARS-CoV-2 RNA, which has 89% nucleotide identity with bat SARS-like-CoV and 82% with that of human SARS-CoV (Chan, Kok, et al., 2020).

The transmission from bats to humans is still unclear; it is still not clear whether a passage to humans occurred through an intermediate species, such as pangolins, or if the original strain had intrinsic capacity to cause disease in humans (T. Zhang et al., 2020).

SARS-CoV-2 is a betaCoV characterized by round or elliptic and often pleomorphic form, and a diameter of approximately 60–140 nm (Cascella et al., 2020). The virus presents the typical coronavirus structure with spike protein, along with other proteins, such as RNA polymerase, 3-chymotrypsin-like protease, papain-like protease, helicase, glycoprotein, and accessory proteins (Shereen et al., 2020).

The genetic features of SARS-CoV-2 strictly resemble both human SARS-CoV RNA and bat SARS-like-CoV RNA, and spike glycoproteins show similarities with bat SARS-like-CoV and an unknown betaCoV (Chan, Kok, et al., 2020; B. Li et al., 2020). The pathogenic mechanism of SARS-CoV-2 in the initial viral attachment is related to the binding affinity between the viral receptor binding domain (RBD) and the host receptor ACE2 (angiotensin-converting enzyme 2), which is also used by the SARS-CoV (X. Xu et al., 2020). Compared to SARS-CoV, SARS-CoV-2 has an increased binding affinity for ACE2, probably due to variations in SARS-CoV-2 spike glycoprotein (Wan et al., 2020). Due to the higher affinity and resulting higher binding capacity

of viral RBD, the number of viruses required to infect a cell is reduced, thus partially explaining the greater transmissibility of SARS-CoV-2 compared to SARS-CoV (Gabutti et al., 2020).
In SARS-CoV-2, the spike receptor-binding domain (S1) presents only 40% amino acid identity with other SARS-CoVs. On the contrary, the S2 subunit, containing a fusion peptide, a transmembrane domain, and cytoplasmic domain, is highly conserved. Thus, S2 could be a target for antiviral (anti-S2) compounds (Cascella et al., 2020).
SARS-CoV-2 shows particular tropism for cells located in the lower airways, where it leads to pulmonary alterations in the parenchyma and gives the typical ground glass aspect, also in patients negative for clinical symptoms (Heymann & Shindo, 2020). Moreover, the expression of ACE2 in minor salivary glands is higher than in the lungs, making epithelial cells of salivary gland ducts early targets of SARS-CoV-2 infection (Liu et al., 2011; To et al., 2020; J. Xu et al., 2020).
According to currently available data, the pathogenic mechanism leading to pneumonia seems based on the capacity of viral infection to produce an excessive immune reaction in the host. In fact, even if in a limited number of cases, the infection causes a reaction labelled as "cytokine storm", which is characterized by extensive production of interleukin 6 (IL-6), produced by activated leukocytes responsible for extensive tissue damage (Q. Ye et al., 2020).
During the overproduction of proinflammatory cytokines due to infection, the coagulation control mechanisms can be compromised, with reduced anticoagulants concentrations. This defective procoagulant–anticoagulant balance may cause an immoderate activation of the coagulation pathway, which predisposes to the development of microthrombosis, disseminated intravascular coagulation, and multiorgan injury/failure (evidenced in severe COVID-19) (Jose & Manuel, 2020).
Consequently, the inflammatory cytokine storm is closely related to the development and progression acute respiratory distress syndrome (ARDS) and extrapulmonary multiple-organ failure, which leads to death; the degree of cytokine increase is positively correlated with mortality rate (Q. Ye et al., 2020).

Transmission routes

Transmission modalities of SARS-CoV-2 have been identified as host-to-human and human-to-human.
The animal-to-human transmission was initially thought to be the main mechanism, because the first cases of COVID-19 were linked to direct exposure to Hunan seafood market in Wuhan city of China, probably related to the exposure to infected animals. However, subsequent cases were not associated with this exposure mechanism, supporting the hypothesis of human-to-human transmission (Shereen et al., 2020).
Symptomatic people are the most likely source of COVID-19 diffusion, but high viral load can be found also in asymptomatic subjects (Zou et al., 2020). It is therefore important to highlight that the potential transmission role of asymptomatic subjects and patients during the incubation period dramatically increases the risk of diffusion (Chan, Yuan, et al., 2020; Rothe et al., 2020; H. Xu et al., 2020; Zou et al., 2020).
Pre-symptomatic transmission has been reported, 1–3 days before the source patient developed symptoms (W. E. Wei et al., 2020).
Three transmission routes have been identified for SARS-CoV-2, namely airborne transmission (cough, sneeze, aerosol and droplet inhalation transmission), direct transmission (contact with oral, nasal, and eye mucous membranes) and indirect transmission (contact with surfaces contaminated by fomites) (Dietz et al., 2020; C.W. Lu et al., 2020; Peng et al., 2020; van Doremalen et al., 2020).

A recent study indicates that the highest viral load is found soon after symptom onset, in greater quantities in the nose than in the throat, similarly to common influenza (Zou et al., 2020).
The virus has also been isolated in serum, blood, rectal swabs, saliva, urine and stool, but fecal-oral transmission has not yet been proven (Gabutti et al., 2020).
The presence of SARS-CoV-2 in saliva opens the possibility of transmission both with direct and indirect contact via saliva (through cough, and respiratory droplets) even among asymptomatic patients (To et al., 2020; W. K. Wang et al., 2004; H. Xu et al., 2020; J. Xu et al., 2020; Zou et al., 2020). Moreover, aerosol transmission can occur when high aerosol concentrations are produced in closed spaces, suggesting an environmental spread of the virus (Dietz et al., 2020; van Doremalen et al., 2020; J. Wei & Li, 2016).
Common clinical manifestations of COVID-19 do not include eye symptoms, but eye exposure may provide an effective way for the virus to enter the body by direct transmission through fomites or droplet (C.W. Lu et al., 2020; Peng et al., 2020).
Concerning indirect transmission through fomite-contaminated surfaces, different viral load can be identified and maintained on different surfaces over time. Viral load is greatly reduced on plastic and stainless steel after 72 hours and 48 hours respectively, while no virus viable remains on copper and cardboard after 4 hours and 24 hours respectively (van Doremalen et al., 2020).

Epidemiology

R0 of COVID-19 has been estimated to 2.3. Thus, on average, each patient transmits the infection to an additional 2-3 individuals (Cascella et al., 2020; Shereen et al., 2020; S. Zhang et al., 2020) which emerged in Wuhan, China and spread around the world. Genomic analysis revealed that SARS-CoV-2 is phylogenetically related to severe acute respiratory syndrome-like (SARS-like). Actually, SARS-CoV-2 R0 value could be as high as 5.7, depending on the lifestyle and habits of the population, therefore control measures should be implemented to obtain a reduction of this value below 1 to limit the spread of cases (Bulut & Kato, 2020; Sanche et al., 2020).
People in close contact with patients with COVID-19, as well as health care workers or family members, are at higher risk of SARS-CoV-2 infection. People of all ages are susceptible to infection, with variable clinical manifestations (Cascella et al., 2020; Meng et al., 2020).
As for the cases distribution by age, 1% were registered in young subjects (0-19 years of age), 8% in young adults (20-29 years), 87% in adults and elderly people (30-79 years) and 3% in elderly patients aged (> 80 years) (Gabutti et al., 2020). It is still unclear if the lower incidence in young people is due to a lower transmission effectiveness of SARS-CoV-2 or whether most cases are not recognized for just being simply asymptomatic (Bulut & Kato, 2020; Lee, Hu et al., 2020).
It has been suggested that a lower degree of maturation and function (e.g. binding capacity) of ACE2 in children may cause a relative resistance to the SARS-CoV-2 (Hossny & El-Owaidy, 2020; R. Lu et al., 2020). Indeed, the largest proportion of asymptomatic individuals are children or young adults, highlighting the important role of young people as asymptomatic carriers of the infection (Bulut & Kato, 2020; Hossny & El-Owaidy, 2020).
COVID-19 fatality rate may reach 6.3, with different values depending on age and country (Bulut & Kato, 2020). In particular, worse disease course and prognosis are observed in elderly patients and patients with preexisting comorbidities (e.g., diabetes, hypertension, cardiovascular disease, chronic respiratory disease, and oncological diseases), while to date few cases occurred in patients aged 9 years or younger (less than 1% of cases) (Bulut & Kato, 2020; Cascella et al., 2020; D. Wang et al., 2020).

Clinical features

Clinical presentation of COVD-19 appears extremely variable, being in some cases characterized by non-specific symptoms. After contagion, median incubation period is 5-6 days prior to symptoms development, but there is evidence that it could be as long as 14 days (Backer et al., 2020; ECDC, 2020a; Meng et al., 2020).

The disease severity may vary from complete lack of symptoms to critical and life-threatening forms. Clinical severity of COVID-19 was defined in 5 groups: asymptomatic infection, mild (uncomplicated), moderate, severe (14% of cases), and critical illness (5% of cases) (Wu & McGoogan, 2020).

In asymptomatic infection, SARSCoV-2 PCR test is positive in absence of clinical manifestations. Mild disease forms are characterized by non-specific symptoms of acute upper respiratory tract infection, such as fever, fatigue, dyspnea, dry cough, sore throat, runny nose, sneezing without pneumonia (Klopfenstein et al., 2020; Lechien et al., 2020). However, anorexia, malaise, muscle pain, myalgia, and olfactory and gustatory dysfunctions have been described. Rarely, these patients may also present with diarrhea, nausea and vomiting, probably due to ACE-2 presence in the gastrointestinal tract (Huang et al., 2020; WHO, 2020a; Wu & McGoogan, 2020; H. Zhang et al., 2020).

In moderate forms patients cough present with pneumonia, often accompanied by fever and cough. Nonetheless, there are no sign of severe pneumonia or hypoxemia, and no need for oxygen supply. In severe cases, the disease presents a rapid escalation to mild pneumonia, with dyspnea (respiratory frequency ≥ 30 breath/min), central cyanosis, oxygen saturation less than 92% on room air, and other manifestations of hypoxemia (WHO, 2020a; Wu & McGoogan, 2020). Usually, within a week conditions evolve towards critical disease, with ARDS and bilateral pneumonia or respiratory failure, sepsis or septic shock, multiple organ dysfunction (MOD) or failure (MOF) (WHO, 2020a; Wu & McGoogan, 2020), probably due to immoderate activation of the coagulation pathway.

Airborne generated procedures: professional risk in Dentistry

R. Izzetti, J.L. Cairoli, S. Gennai, F. Graziani

Bioaerosols and types of transmission

Background

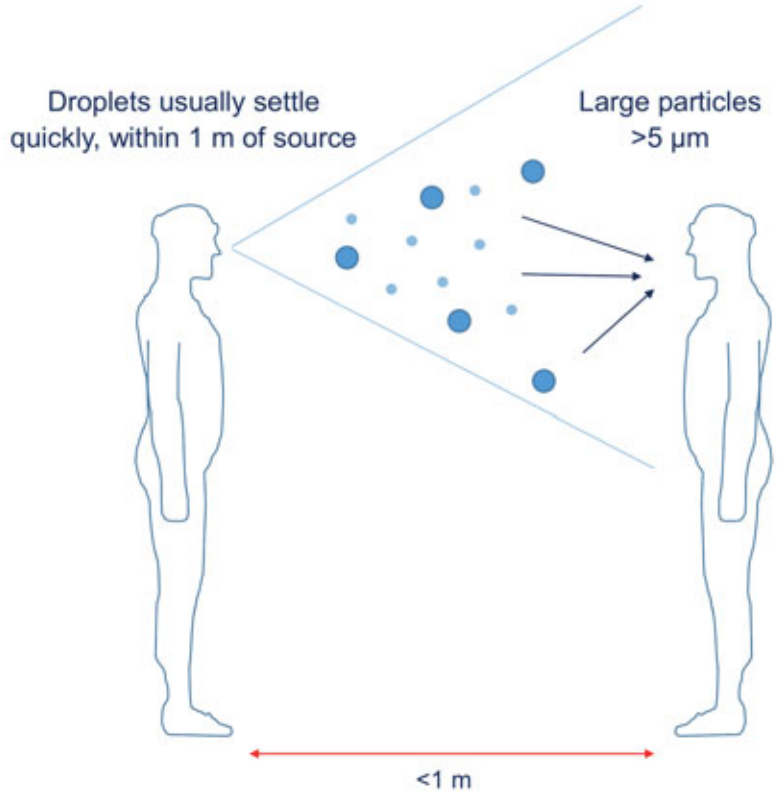
Aerosols are suspensions of fine solid particles or liquid droplets in air or another gas. Aerosols are classified depending on the diameter of particles, with larger particles being characterized by a reduced permanence in air and a subsequent relatively fast precipitation, while smaller particles typically remain airborne for longer periods.

Type of aerosol	Particle dimensions	Time of precipitation
Fine mist	10-100 µm	10 seconds for a droplet of 100 µm 1 minute for a droplet of 40 µm 4 minutes for a droplet of 20 µm
Ultra-fine aerosol	7-10 µm	20 minutes for a droplet of 10 µm
Extremely fine aerosol	4-7 µm	30-45 minutes for a droplet of 5-10 µv
Micro-aerosol	1-3 µm	Particles ≤ 5 µm (droplet nuclei) may be inhaled to alveoli
Sub-micron aerosol	0.5-1 µm	Particles ≤ 5 µm (droplet nuclei) may be inhaled to alveoli

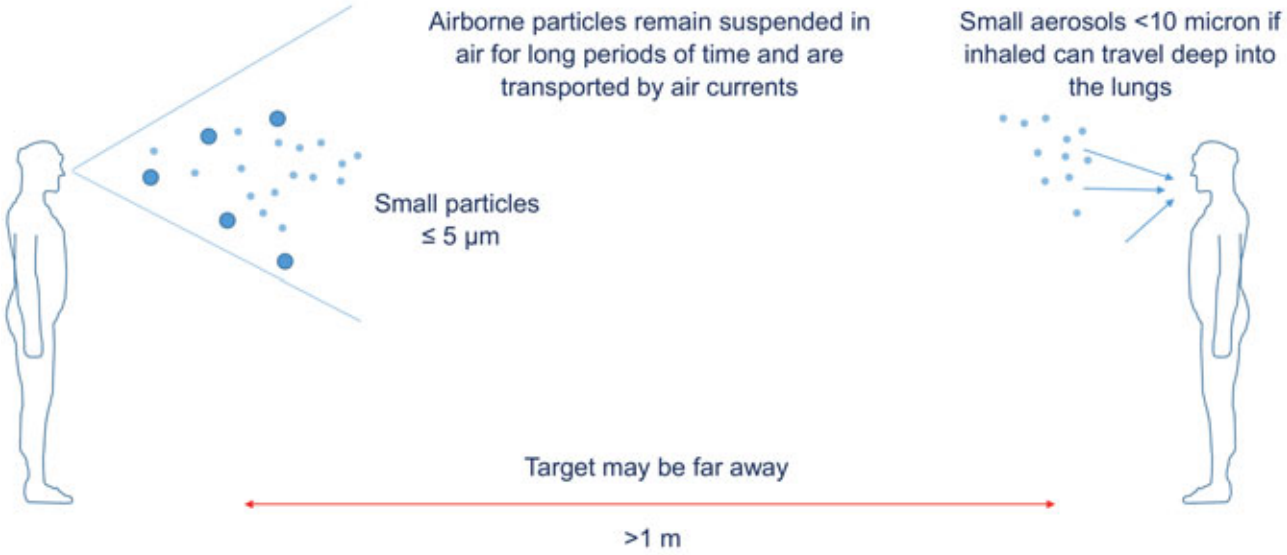
Bioaerosols are a peculiar type of aerosols, which are characterized by the presence in aerosol particles of live and dead micro-organisms, either as individual micro-organisms or as aggregates. A growing interest on bioaerosols in the past two decades appears related to the development of several adverse health outcomes in association to bioaerosols exposure in occupational environments, causing infections, allergies and immune reactions, non-allergic inflammations, and toxic effects (Schlosser 2019).

Based on size and persistence of an aerosol, the WHO uses the diameter of 5 µm as a cutoff to discriminate between airborne (≤ 5 µm) and droplet (> 5 µm) transmission (Kutter et al. 2020). Droplets usually settle quickly, within 1 m of source. Particles >10 µm in aerodynamic diameter are blocked in the nasal region, while dimensions between 5 and 10 µm can reach and deposit in the upper respiratory system. Only particles below 5 µm can reach the alveoli and cause lower respiratory tract infection.

Droplet transmission occurs with droplets landing directly on mucosal lining of nose, mouth, and eyes of nearby persons, or through inhalation. In droplet transmission, the target (susceptible individual) must be close enough to the source (infected individual) for the infected droplet to make contact with the susceptible individual's respiratory tract, eyes, mouth, nasal passages.

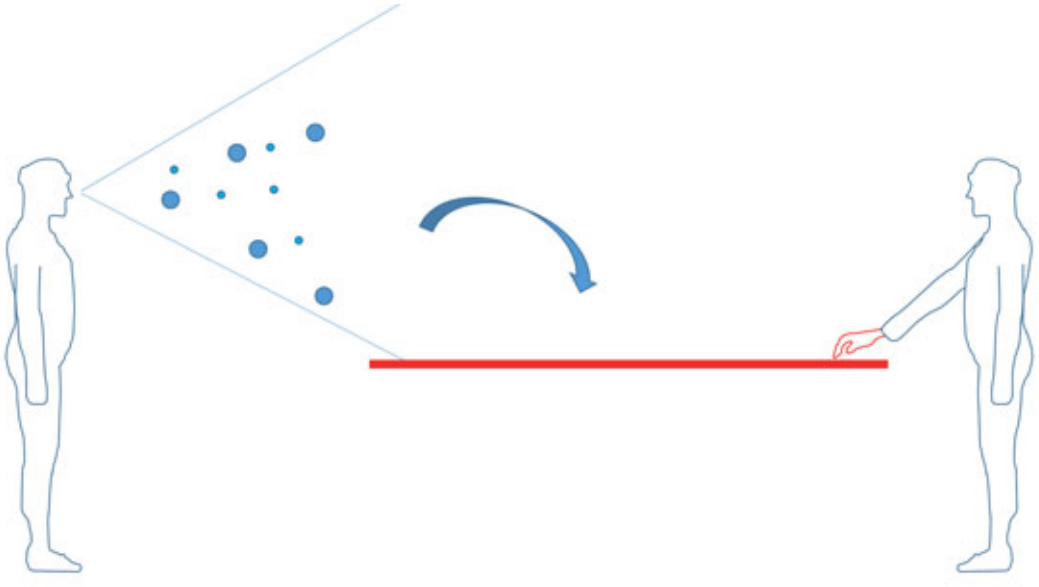


In aerosol transmission, airborne particles smaller than 5 µm remain suspended in air for long periods of time and are transported by air currents, and if inhaled can travel deep into the lungs. In this type of transmission, distance relationship between source and target is not strictly related to the probability of infection, as also targets located far from the source may be infected.



A third type of transmission is related to contact with infected surfaces, where aerosols secretions (especially droplets) contaminate nearby surfaces. As a consequence, contact with

infected surfaces may pass the infection to others, in particular if eyes, nose, or oral mucosa are touched after the contact with the infected surface.



Considerations on dental practice

Bioaerosols have gained extreme importance during COVID-19 pandemic. In fact, SARS-COV-2 recognizes an inter-human transmission through droplets, which can be either inhaled or can transmit the virus through contact with infected surfaces (Dietz et al. 2020, Lee & Hsueh, 2020). The virus has been isolated in serum, blood, and saliva (ECDC, 2020b). Thus, the relative closeness to the patients, the high frequency of aerosol generating procedures and the exposure to biological fluids make the dental professionals extremely exposed to the virus. Patients at higher risk of being infectious are those in which symptoms have already developed. However, also asymptomatic patients appear highly contagious, due to the presence of a viral load similar to symptomatic subjects (Zou et al. 2020).

SARS-CoV-2 appears to be quite resistant, both on surfaces and in aerosol. In particular, coronaviruses are reported to resist on inanimate surfaces like metal, glass or plastic for up to 9 days (Kampf et al. 2020). van Doremalen et al. (2020) estimated a median half-life for SARS-CoV-2 of approximately 5.6 hours on stainless steel and 6.8 hours on plastic. However, similarly to other CoVs, SARS-CoV-2 can be effectively inactivated by lipid solvents including ether (75%), ethanol, chlorine-containing disinfectant, peroxyacetic acid and chloroform (Cascella et al. 2020).

Suggestions

Infection management and reduction appear as a combination of various factors: i) identification of patient's risk of infection; ii) identification of dental procedures more prone to aerosol production; iii) correct use of PPE; iv) disinfection of surfaces.

Conclusions

1. Bioaerosols are potential carriers of various types of infection.
2. SARS-CoV-2 can be transmitted through droplet inhalation or direct contact with infected surfaces.
3. Several strategies can be adopted to limit viral transmission.

Aerosol generating procedures

Background

The risks related to aerosol generating procedures (AGPs) has been already highlighted with the diffusion of SARS. Several medical procedures are listed among the most exposed to acute respiratory infections transmission, including endotracheal intubation, non-invasive positive-pressure ventilation, tracheostomy, manual ventilation before intubation, bronchoscopy, open suctioning, administration of nebulized treatment, turning the patient to the prone position, disconnecting the patient from the ventilator, and cardiopulmonary resuscitation (Tran et al. 2012, Bahl et al. 2020). According to the WHO, these procedures should be conducted with the adoption of some preventive measures, such as hand hygiene, avoiding touching eyes, nose, and mouth, coughing or sneezing into a bent elbow or tissue and then immediately disposing of the tissue, wearing a mask in cases of respiratory symptoms, and thorough routine cleaning and disinfection of environmental surfaces.

Considering COVID-19-related risks, it is advised first of all to ensure correct patient triage, early recognition, and prompt isolation of suspected and confirmed COVID-19 patients. Subsequently, airborne precautions should be adopted in particular when performing AGPs (Wilson et al. 2020).

SARS-CoV-2 appears to present similarities with SARS-CoV in terms of transmission through contact, droplet and airborne routes (Yu et al. 2004). In clinical setting, it is difficult to evaluate droplet and airborne transmission as separate. Moreover, several environmental factors, including temperature and humidity, appear to have a role on the virus half-life in suspension (van Doremalen et al. 2020). Similarly to what happened for the recent epidemics of SARS, MERS, and Ebola, protection of the occupational health and safety of health workers should be ensured by the application of precautionary measures (Bahl et al. 2020). Measures to mitigate airborne transmission should be employed at times of risk. However, the mechanisms and risk factors for transmission are largely unconfirmed. Whilst awaiting robust evidence, a precautionary approach should be considered to assure healthcare worker safety.

Suggestions

CDC recommend the use of respirators when performing AGPs (CDC, 2020b). According to the WHO, contact and droplet precautions should be adopted by health care workers dealing with suspected COVID-19 patients (WHO, 2020c). Medical masks can be used for routine care, while respirators (airborne precautions) should be employed for AGPs.

Conclusions

1. Some procedures are classified at high risk of aerosol generation.
2. For high risk procedures, respirators should be employed to limit the risk of contagion.
3. Being the knowledge on SARS-CoV-2 transmission still evolving, a precautionary approach should be adopted.

Professional hazard by SARS-CoV-2

Background

Dentists appear extremely exposed to the risk of being infected through airborne particles (Harrel 2004, Harrel & Molinari 2004). In routine clinical situations, it is reported that dental procedures contribute to the generation of highly contaminated microbial aerosol (Helmis et al. 2007). With the spread of COVID-19, two factors seem to concur to the exposure of dentists to SARS-CoV-2. Firstly, the relatively close contact with the patient may expose the dental professional to direct inhalation of patients droplets, coughing, and sneezing or to contact with mucous membranes of oral cavity, nasal cavity, and eye (Izzetti et al. 2020, C.W. Lu et al. 2020). Secondly, the large amount of aerosol produced during the majority of dental procedures appears extremely dangerous due to the presence of the virus in saliva and blood (Azzi et al. 2020, To et al. 2020). Moreover, risks increase especially in patients in their incubation period, or who are unaware they are infected (Meng et al. 2020).

Suggestions

The reduction of aerosol-generating procedures, in terms of quantity and quality, is recommended when possible (Izzetti et al. 2020).
The following preventive measures can be adopted:

- Try to go fully manual and avoid the use of handpieces/ultrasonic scalers when possible.
- Use rubber dam whenever indicated.
- If handpieces are employed, patient barriers can be used to limit operator exposure.
- Use surgical/potentiate aspiration or HVE (High Volume Evacuation) System.
- Consider employing virucidal solutions in handpiece spray.
- Frequently renew indoor air.

Conclusions

1. Dental practitioners are extremely exposed to aerosols during their practice.
2. COVID-19 transmission routes increase the risk of contagion for dental practitioners.
3. Measures to reduce aerosol production should be adopted to reduce risks.

PHASE I: Pre-triage

R. Izzetti, J.L. Cairoli, M. Nisi, F. Graziani

Patient triage

Patient's triage provides some fundamental advantages:

- Early recognition of potentially positive patients before treatment.
- Minimization clinical risk with patient risk allocation.
- Performing triage in two distinct moments in time with the same set of questions provides a "double check" on patient health status.
- Enhancement of the compliance of patients.
- Supports to public health in early recognition of subjects potentially affected by COVID-19.
- Help in the early detection of potentially infected asymptomatic patients by investigating their habits, acquaintances, and working environment.

Patient risk profile

Background

Systematic risk profiling has been proposed for several medical branches to reduce the risks related to various types of interventions (Donaldson & Noble 2010). In this moment of pandemic, the risk profiling procedures appear of crucial importance when dealing with patients who are potentially infected with SARS-CoV-2, although potentially each subject is contagious. Risk profiling in this sense has various aspects to be taken into consideration. First of all, the risk of viral transmission to the dental professional should be carefully evaluated. It is true that various measures can be adopted to reduce infection risk, in particular the use of adequate Personal Protective Equipment (PPE). However, the peculiar aspects of dental profession, including the relatively close contact with the patient and the production of aerosol and spatter during the majority of dental procedures are aspects which should be certainly taken into consideration. Moreover, one might consider also the risk of cross-infection. So far, dentistry focused on how to manage extremely resistant pathogens, such as HCV and HIV. In the case of SARS-CoV-2, the subtle way of transmission through airborne particles - which can remain in suspension in the air for up to three hours - surely complicates the management of the dental practice and of the adjacent spaces occupied by patients (van Doremalen et al. 2020). Moreover, the long resistance on surfaces for 9 hours appears another factor to be evaluated for the correct disinfection of all potentially contaminated surfaces. Last but not least, it is important to highlight that viral transmission occurs also through apparently asymptomatic patients, which could be carriers of infection without developing symptoms (Chan, Yuan et al. 2020, Rothe et al. 2020). It has been stated in the literature that viral transmission may occur 4-4.6 days after contagion, while symptoms may develop even 14 days after contagion. This fact appears extremely worrying as also apparently healthy subjects may represent an actively infecting viral reservoir.

Objectives

Risk profiling during COVID-19 allows the identification of four different types of patients which may enter our practice (Izzetti et al. 2020). In particular, we can recognize:

- Patients positive for SARS-CoV-2: this group includes patients who currently present symptoms suggestive for COVID-19, and/or have been demonstrated to be infected. It is extremely difficult that this type of patients will enter our practice, as the absence of suggestive symptoms should be investigated prior to receiving the patient.
- Patients at high risk for COVID-19: these patients do not have symptoms suggestive for COVID-19, but report contact with infected or quarantined subjects. It is known that incubation period for COVID-19 ranges between 2 and 14 days, therefore these subjects are potentially infected, but are still not showing symptoms.
- Patients recovered from COVID-19: this group poses a very difficult question, which has still to be deeply investigated. These patients are negative for SARS-CoV-2, but recent evidence has shown that re-infection may occur. It is therefore important to exclude the presence of symptoms also in this type of patients.
- Patients at unknown risk: these patients have a negative history both for symptoms and exposure to infected subjects. This category poses the high risk as potentially contagious.

Suggestions

Unless a quick test or alternative diagnostic strategies are available, all patients entering our practice are potentially infected and, most importantly, infectious. Therefore, risk profiling should be always performed to assess the potential presence of SARS-CoV-2, in order to reduce the risk of contagion both for dental workers and patients.

In patients who are positive for COVID-19 or at high risk, treatment should be postponed if possible. If the patient needs urgent treatment due to the presence of acute symptoms, referral to COVID Hub is advisable.

Conclusions

1. Risk profiling appears an effective tool in assessing the potential presence of infection in patients.
2. Four types of patients can be identified: patients positive for SARS-CoV-2, patients at high risk of being infected, recovered patients, patients at unknown risk. However, from a practical standpoint, COVID-19 positive patients and patients at unknown risk are the most relevant.
3. The classification of the risk class for each patient entering our practice is fundamental to reduce the risk of contagion for dental workers and cross-infection of patients.

ACTION 1: PHONE TRIAGE

WHO: Non-clinical staff

WHERE: Patient at home

WHAT: Phone triage

Background

Phone triage has been frequently employed as an effective tool in several medical fields, in particular in primary care (Boggan et al 2020). Triage allows to assess the degree of severity of a clinical situation, and potentially dispose hospitalization. The beneficial effect of telephone triage is related to the reduction in the burden of primary care units and the access to emergency departments, due to the possibility to resolve from remote.

Recently, Judson et al. (2020) have applied triage to investigate on patient symptoms to exclude COVID-19. Moreover, Izzetti et al. (2020) suggested the application of a phone triage questionnaire to assess the potential risk of infection in patients which could potentially enter the dental practice.

Phone triage presents the following advantages:

- Early recognition of potentially infected patients
- Organization of working list according to patient risk profiling
- Social role in recognizing early signs of contagion

Objectives

Phone triage aims at investigating the presence of COVID-19, both active and previous. The presence of symptoms suggesting COVID-19, and the history of contacts with infected or quarantined subjects allows to reduce the risk of contagion both for dental professionals and other patients. In particular, the early recognition of potentially risky behaviors may help the identification of potentially exposed patients (Izzetti et al. 2020). This is of extreme importance when dealing with asymptomatic patients who have been exposed to SARS-CoV-2, who are potentially during incubation phase, but, as reported by the literature, potentially infectious (Chan, Yuan et al. 2020, Rothe et al. 2020). Therefore, the risk assessment in this early phase prior to the access to the dental practice appears an extremely valid tool for contagion control in dental setting. Moreover, understanding the real need of a professional consultation, and possibly addressing the issue with just pharmacologic prescription allows the respect of social distancing measures to limit contagion.

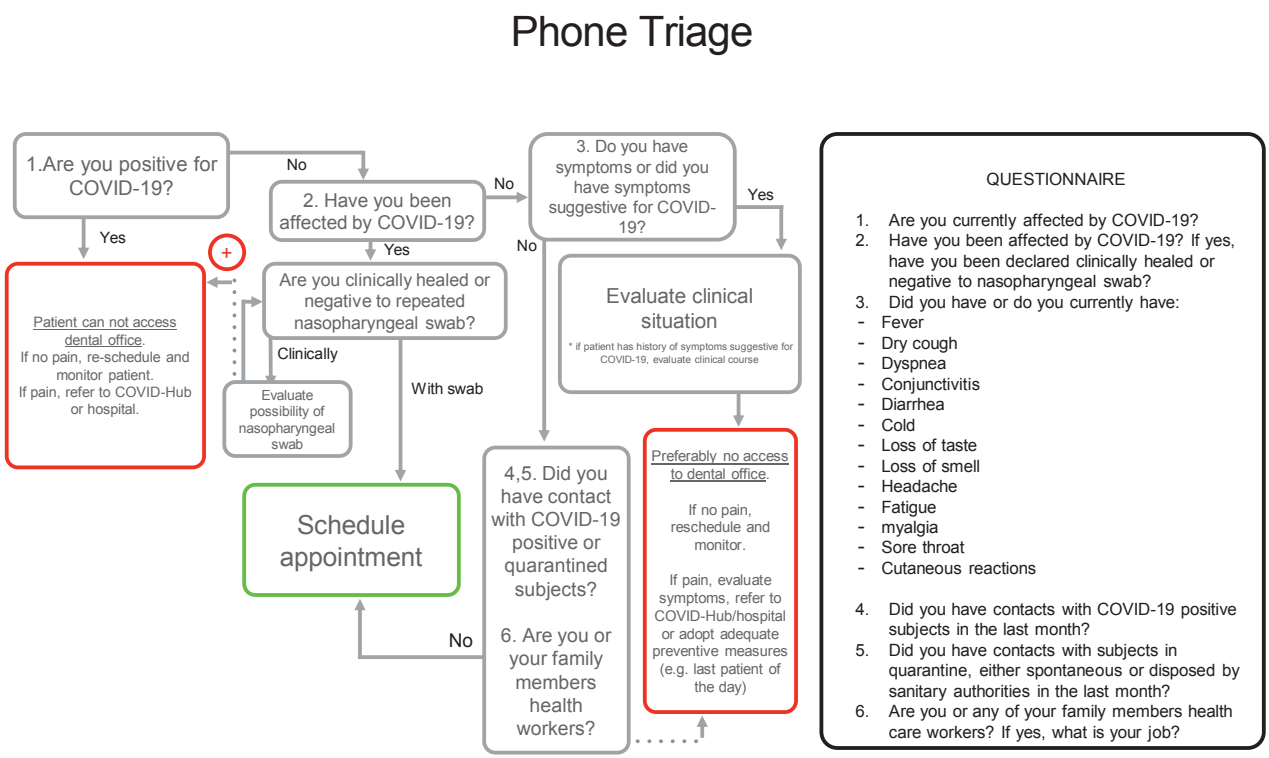
Suggestions

The following set of questions should be asked during phone triage (Izzetti et al. 2020):

- Are you currently affected by COVID-19?
- Have you previously been infected by COVID-19? If yes, have you been declared clinically healed from COVID-19 or with nasopharyngeal swab?
- Do you currently have any of the following symptoms, such as fever, cough, respiratory difficulty, conjunctivitis, diarrhea, flu, anosmia, ageusia?

- Did you have in the last month of the following symptoms, such as fever, cough, respiratory difficulty, conjunctivitis, diarrhea, flu, anosmia, ageusia?
- Did you have any contact with SARS-CoV-2–infected patients in the last 14 days? 4 weeks?
- Did you have any contact with subjects placed in quarantine, either self-disposed or organized by the health authorities, in the last 14 days? 4 weeks?
- Did you have any contact with subjects coming from highly epidemic regions in the last 14 days? 4 weeks?
- Have you been in any situation surrounded by a significant portion of subjects (other than the ones who are normally in quarantine with you) in the last 14 days?
- Are you a health care worker? If yes, what is your job?

Triage should be dynamically modified according to the course of the pandemic.
Lastly, patients must be advised of the new protocols and procedures implemented that they will find at their arrival, inviting them to reach the practice wearing a mask. Moreover, patients will be discouraged to present with an accompanying person. Obviously, exceptions are pediatric patients, special need, and elderly patients.



Conclusions

1. Phone triage is a reliable tool in several medical fields.
2. Phone triage is a valid support for patient risk profiling for COVID-19.
3. A set of questions should be asked to investigate the presence of symptoms or behaviors suggesting the presence of COVID-19.

ACTION 2: AGENDA SET-UP

WHO: Non-clinical staff

WHERE: Dental practice

WHAT: Agenda set-up

Background

One of the aims of the triaging process is the recognition of the treatments which need immediate care and cannot be postponed (Izzetti et al. 2020). However, due to the preventive measures which should be adopted in terms of avoiding crowding and guaranteeing social distancing, it becomes fundamental to properly organize the work-flow in order to conduct each procedure in total safety both for patients and dental workers. In particular, some measures need to be adopted to limit potential exposure to contagion.

Objectives

It is extremely important to reduce and organize the access to the dental practice, in particular excluding potential contacts with infected and/or symptomatic subjects both for the patients and the potential accompanying subjects. Therefore, all people entering the dental practice should be screened for signs and symptoms of COVID-19 during patient check-in, and should not be allowed to enter the facility if signs and symptoms are present (e.g., fever, cough, shortness of breath, sore throat) (Izzetti et al. 2020, Li & Meng 2020, Meng et al. 2020, Peng et al. 2020). Access to the clinical area should also be subject to restrictions, and AGP performance should be scheduled at the end of the day (ADA 2020).

Suggestions

The following strategies should be adopted to improve the organization of the patient list:

- Schedule appointments apart enough to minimize possible contact with other patients in the waiting room (chairs spacing of at least 1 meter).
- Invite patients to wear masks in the waiting room.
- Avoid the contemporary presence of more than 2 patients.
- Aerosol-generating procedures should be scheduled as the last appointment of the day.
- When possible, discourage the presence of accompanying people, except for pediatric patients, people with special needs, elderly patients.
- Patients suspected to be positive for COVID-19 should be rescheduled or scheduled as the last appointment of the day.
- Patients considered in a condition of vulnerability should be scheduled as the first appointment of the day.

Conclusions

- Patient list organization needs to be revised according to the current measures of social distancing.
- Limitation to the access to dental practice is advised.
- Some strategies can be adopted to improve patient list organization.

ACTION 3: SELF-CERTIFICATION

WHO: Clinical and non-clinical staff

WHERE: Dental practice

WHAT: Self-certification

Background

Health care workers are among the most exposed group to COVID-19 infection (Lancet 2020). Due to the peculiarity of dental setting, all the staff members of the dental practice appear exposed to contagion. The CDC strongly recommends that all health care staff showing symptoms suggestive for COVID-19 should not report to work. In particular, CDC identifies different strategies for the assessment of health care workers (CDC 2020a).
If symptoms are present, the worker should be excluded from work until at least three days have passed since recovery (spontaneous fever resolution and improvement in respiratory symptoms), and if at least 10 days have passed since symptoms onset. Moreover, the negative result of two nasopharyngeal swabs collected ≥24 hours apart supports the decision of allowing access to the workplace.

Objectives

It is important to early detect potential signs of COVID-19 also among co-workers, in order to avoid infection both of the rest of the staff and patients.

Suggestions

Prior to the beginning of daily activity, all the members of clinical and non-clinical staff must be screened for the presence of fever and/or symptoms suggestive for COVID-19. Moreover, potential contacts with infected or quarantined subjects should be ruled out. If a staff member refers symptoms or has fever, the worker should be asked to leave the workplace wearing a mask

Conclusions

All the team members should sign a certification reporting:

- The absence of symptoms suggestive for COVID-19.
- The absence of contacts with infected/at risk subjects.
- The absence of contacts with quarantined subjects.

PHASE II: Upon patient arrival

L. Lardani, M.R. Giuca, R. Izzetti, F. Graziani

Background

Dental professionals should minimize the risk of cross-infection and ensure the safety of all the staff, while guaranteeing dental care to the population. The overall organization should adapt to a model in which both clinical and non-clinical activities must be regulated differently.

Suggestions

Importantly, in the preliminary phase, it is suggested to provide training and simulation of the procedures for COVID-19 prevention, in order to facilitate familiarity and identification of otherwise unidentified problems (Cook et al., 2020).

ACTION 4: PRACTICE SET-UP

WHO: Non clinical staff

WHERE: Dental practice

Reception

- All the member of the staff, both clinical and non-clinical, should be instructed on the new protocols to avoid COVID-19 infection.
- Non-clinical staff should wear the minimum PPE set (surgical mask, gloves and goggle) to protect from contact, droplet and airborne transmission. It is thus advised the use of surgical masks, even in non-clinical areas, and glasses and gloves all the time of the shift.
- Social distancing measures are advised, by keeping 1 m distance between colleagues, also by using wall mounted rulers.
- The correct wearing of PPE for non-clinical staff is:
  1. Surgical mask
  2. Gloves
  3. Goggles

Reception desk set-up

The reception could be a high risk room for airborne transmission due to possible proximity between patients and non-clinical staff.

- The reception should be adapted and anything that may be touched by the patient (handles, pens, etc.) should be removed (Sexton et al., 2018). If this appears unfeasible (i.e. in cases of POS terminal), disinfection with 0.1% sodium hypochlorite or 70% isopropyl alcohol should be performed after each patient.

- Likewise, all potentially exposed surfaces of the reception should be disinfected regularly (G. Ye et al., 2020).
- A plexiglass screen divider can be positioned on the reception desk to protect non-clinical staff from droplets or airborne transmission. A mark on the floor should be used to highlight 1 m distance from the desk, in order to guarantee social distancing.
- Frequent and adequate ventilation is recommended, in order to facilitate air circulation and reduce the potential presence of airborne particles.
- Supplies for infection control, such as 70-95% alcohol-based hand rub, surgical masks, tissues, and no-touch bin for disposal, should be easily available.

Waiting room set-up

Our patients usually spend a variable time in the waiting room, and to make the stay more comfortable we often provide magazines, journals, brochures of the treatments offered, marketing materials, and also toys for our little patients. However, all these things can favor viral transmission, therefore our waiting room needs a thorough re-organization.

- The seats should be placed at 1 m distance from one another, in order to respect social distancing.
- The waiting room should re-organized and all the objects which could potentially favor viral transmission should be removed, including journals, magazines, reading materials, and also toys, sheets, and pencils for pediatric patients (Sextone et al., 2018; G. Ye et al., 2020).
- Frequent and adequate ventilation is recommended, in order to facilitate air circulation and reduce the potential presence of airborne particles.
- Long-staying in the waiting room should be avoided, and patients should be asked to arrive on time and be informed of the new protocol when scheduling the appointment (CDC, 2020c).
- Further information on correct hand hygiene, social distancing measures, and coughing etiquette can be displayed as infographics (WHO, 2020b).

ACTION 5: PATIENT ARRIVAL AT THE PRACTICE

WHO: non-clinical staff

WHERE: non-clinical area

Patient reception

- When patients arrive at the practice, if not equipped with PPE, a surgical mask should be given, and patients should be invited to wear it for the entire staying in the non-clinical area. Designated bins for masks and gloves disposal should be available for the patients to remove PPE if necessary (Ling et al., 2020).
- Afterwards, a 60% hydro-alcoholic solution should be available for the patients to perform hand disinfection, or alternatively to wash their hands if possible.
- The patient is invited to keep wearing the mask during the triage and the stay in the waiting room.
- Body temperature of patients should be measured when entering the dental practice, using a contactless forehead thermometer and patients are invited to leave their coats, telephone and other belongings in a cleansable box/locker (Peng et al., 2020).
- The patient should also sign a written consent on the triage.

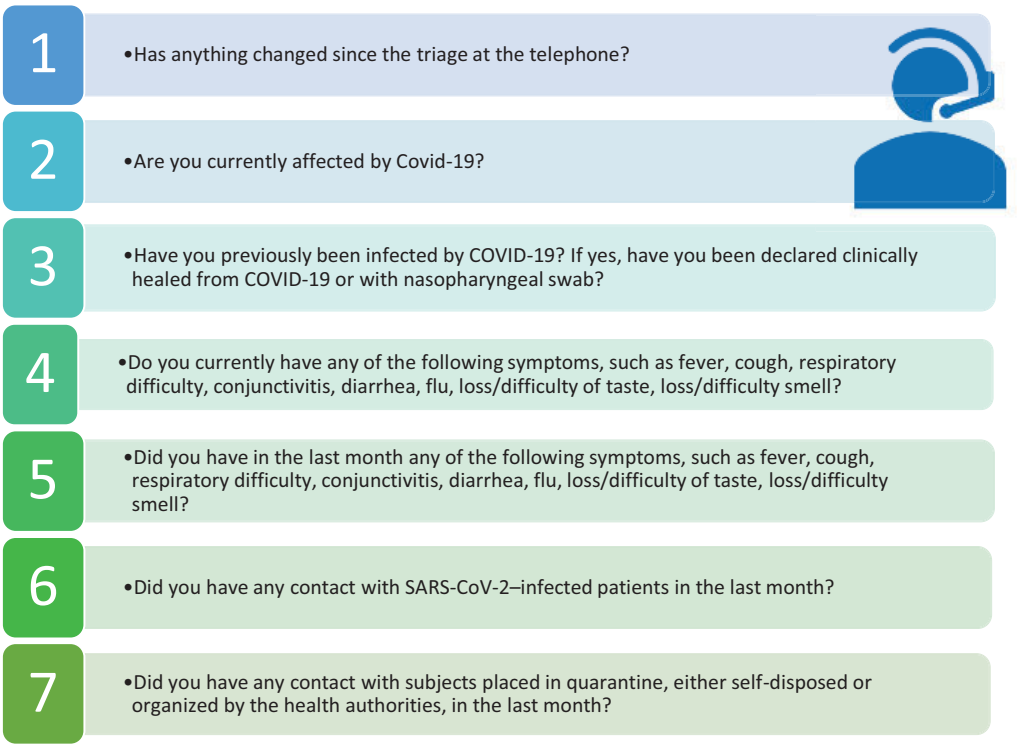
In-office triage

As reported for emergency and primary care units, the repetition of the triage on the arrival of the patient appears effective in assessing the clinical severity. As for the telephonic triage, in office triage prior to entering dental practice may help stratify the risks related to potential exposure to COVID-19 and/or development of symptoms. Several authors (Izzetti et al., 2020; Li & Meng, 2020; Meng et al., 2020; Peng et al., 2020) suggested the establishment of pre-check triages to measure and record the temperature of every person entering the dental practice or clinic as a routine procedure.

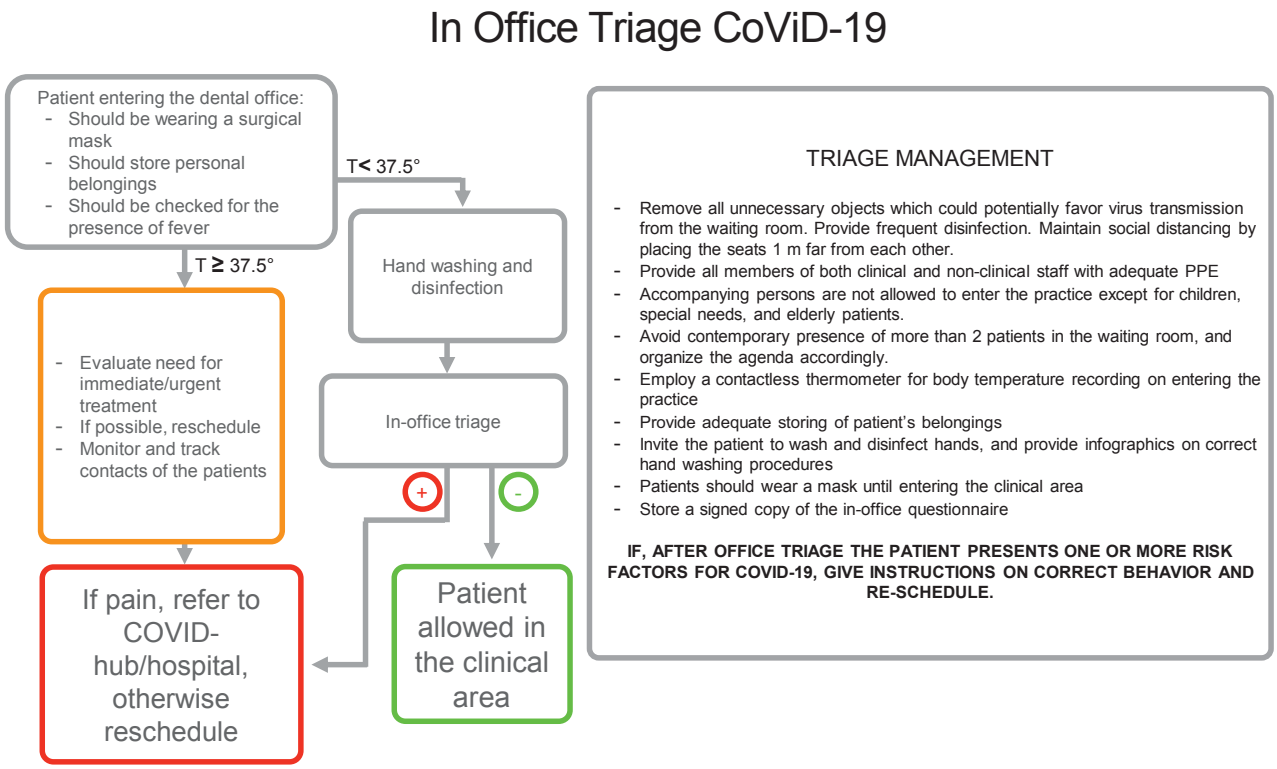
Triage repetition aims at excluding potential contacts with infected or quarantined subjects, and the presence of behaviors which may have exposed the patient to contagion. Moreover, incubation time for COVID-19 is reported to be between 2 and 14 days, therefore the patient could potentially have developed symptoms in the meantime.

- When the patient enters the dental practice, it is essential to repeat the triage questionnaire.
- If the patient gives negative answer to all questions, treatment can be performed. If the patient gives one or more positive answers to the questionnaire, treatment should be postponed. If the treatment cannot be postponed due to the presence of acute pain, abscess, trauma, or situation requiring immediate care, the patient should be referred to a COVID-hub center or to the hospital for a safe management of the problem.
- It is important to refer to common sense and organizational skills of the clinical team.
- Patients should be triaged from non-clinical staff wearing a surgical mask.
- Patients should be triaged with the same questionnaire used during the telephone triage to assess potential changes in the health status and/or conditions.

The following questions on arriving at the dental practice should be asked to the patient:



If the patient answers "**no**" to all the questions, treatment can be performed and the patient should be invited to take seat in the waiting room always wearing a surgical mask.
Otherwise, patients should be suggested to contact health authorities, and treatment should be postponed.



Accompanying person

It is advised to discourage the presence of accompanying subject (ADA, 2020). However, in cases of pediatric, special needs, or elderly patients, the accompanying person should not sit in the waiting room and possibly wait outside from the dental clinic. If this is unfeasible, all accompanying subjects should undergo the same procedures of the patients:

- Temperature recording
- Hand disinfection
- Written consent for triage questionnaire
- Triage

ACTION 6: PREPARATION OF THE CLINICAL AREA

WHO: Clinical staff

WHERE: Clinical area

WHAT: CLINICAL ROOM PREPARATION

- Due to COVID-19 persistence for up to 9 days on metal, glass, and plastic thorough disinfection should be performed of all the inanimate surfaces with dedicated disinfectants, including 0.1% sodium hypochlorite within 1 minute, 62–71% ethanol, 0.5% hydrogen peroxide, chloro-derivative solution or other disinfectant presents in the list of CDC (Kampf et al., 2020). SARS-CoV-2 was more stable on plastic and stainless steel than on copper and cardboard, and viable virus was detected up to 72 hours after application to these surfaces (van Doremalen et al., 2020).
- To minimize cross-infections and to allow for more accurate disinfection, the dental unit and all auxiliary tools (microscope, camera, X-ray, magnifying systems, telephone, computer and tablet) should be protected with disposable film. Keyboards and doorway keypads are wrapped in transparent covers and cleaned regularly (Ling et al., 2020).
- It is also important to prepare in advance all the necessary instruments and materials allow time reduction the of the procedure (Izzetti et al., 2020).

ACTION 7: CLINICAL STAFF PROTECTION

WHO: Clinical staff

WHERE: Clinical area

WHAT: CLINICAL STAFF PROTECTION

Hand hygiene is the most effective method of decreasing the risk of the transmission of Covid-19. Hand hygiene instructions include the performance of a 60 seconds hand washing with antimicrobial soap and water, or application of hydroalcoholic solution (WHO, https://www.who.int/gpsc/clean_hands_protection/en/). Adherence to hand hygiene instructions is fundamental to limit viral diffusion, and in particular it should be performed before and after contact with patients, after contact with contaminated surfaces or equipment, and after removing PPE (Ather et al., 2020; Coccolini et al., 2020).

- Hand washing for at least 60s or 60% hydroalcoholic solution application should be performed prior to PPE wearing.
- The highest level of PPE available should be always used to reduce the risk of exposure.
- PPE provide protection to the skin and mucous membranes of eyes, nose, and mouth from exposure to blood or potentially infected materials. Wearing gloves, surgical masks, protective eyewear, and protective clothing in specified circumstances reduces the risk of exposures to blood borne pathogens (Guidelines and Recommendations | Infection Prevention & Control in Dental Settings | Division of Oral Health | CDC, 2020).

The PPE set includes:

- Respiratory protection (FPP2 or FPP3 mask)
- Eye protection (goggles, face shields)
- Body protection (surgical cap & gown)
- Hand protection (gloves)

PPE should be worn following this order:

1. Wearing pair of gloves
2. Wearing the gown
3. Wearing the cap
4. Wearing the FFP2/FFP3 & surgical masks
5. Wearing the goggles and face shield
6. (Wearing second pair of gloves)

Wearing gloves

Clinical staff should perform hand hygiene and disinfection prior to wearing gloves (Ather et al., 2020; Coccolini et al., 2020). Gloves should be worn in case of contact with oral mucous membranes, body fluids, and any potentially infectious material, and should be checked for faults after wearing.

Reduce the likelihood that microorganisms present on the hands of clinical staff will be transmitted to patients during dental procedures.

The gloves must extend to cover wrist of isolation gown.

Wearing gown

Gowns are the second-most-used piece of PPE, following gloves. Isolation gowns should be worn to protect arms and exposed body areas during dental procedures and patient care activities when anticipating contact with clothing, blood, body fluids, secretions and excretions (Selcen Kilinc, 2015).

There are two different types of gowns, disposable and reusable. The reusable, long-sleeved water- repellent surgical gown, can be effectively employed for protection from aerosol, blood and saliva, in particular when performing AGPs (Kowalski et al., 2020).

Correct wearing provides full coverage of the torso from neck to knees, arms to end of wrists, and wrapping around the back and fastening in back of neck and waist (CDC, 2014, https://www.cdc.gov/hai/pdfs/ppe/PPE-Sequence.pdf). If water-resistant gowns are not available, a single-use plastic apron worn over the non-water-resistant gown can be used.

Wearing cap

We also recommended to wear a surgical cap to protect the head.

Wearing mask

There are different types of masks which can be used in dental practice:

- Surgical mask
- FFP2/FFP3 without respirator
- FFP2/FFP3 with respirator

Surgical masks do not effectively filter SARS–CoV-2 during coughs by infected patients, due to the reduced ability of filtration.

Further evaluation is needed to recommend whether face masks decrease transmission of virus from asymptomatic individuals or those with suspected COVID-19 who are not coughing (Bae et al., 2020).

The respirator protects from aqueous and oily aerosols, smoke, and fine dust, and is also effective in protecting against airborne infectious agents such as COVID-19 and SARS. Respirator masks prevent viruses from entering the body through the mucous membranes of the mouth and nose.

FFP2 masks have a minimum of 94% filtration percentage and maximum 8% leakage to the inside. FFP3 masks are the most filtering mask of all the FFPs, with a minimum filtration percentage of 99% and maximum 2% leakage to the inside, providing protection even against very small particles (Ferioli et al., 2020). Being the dimension of SARS-CoV-2 120 nm (0.12 μm) and aerosol particles ranging between 3-100 nm, it is important to highlight that FFP3 filtrates up to 99% of all particles ≤0.6 μm.

FFP3 masks are recommended for all clinical staff, in particular when exposed to AGPs and in cases of confirmed COVID-19 positive patients. If the mask has a respirator, a surgical mask can be applied on the FFP3 (Izzetti et al., 2020).

The use of a FFP2/FFP3 mask, with or without valve, is advised. However, the use of a mask with valve is reported to be more comfortable if worn for a long time. The use of a FFP2/FFP3 valve mask carries a risk of contamination, therefore it is suggested to apply a surgical mask on top (Small Business Standards, 2020).

The correct wearing is fundamental to guarantee filtration, and a fitting test should be performed after wearing the respirator.

Face masks should be changed after each dental procedure, between patients and if mask becomes wet during patient treatment.

Wearing goggles and face shield

Eye protections include various devices, such as goggles, spectacles without side shields, spectacles with side shields, face shields (with solid top and sides) (ECDC, 2020a). Personal eyeglasses are not considered adequate eye protection.
Goggles are excellent in protecting from front and side splash but are considered insufficient for face and neck protection. Goggles without lateral shielding provide only frontal protection from spatter, and are thus inadequate for side impact protection. It is advised to employ PPE providing both frontal and lateral protection.
Face shields, with solid top and sides, depending on thickness and length and type, may represent a valid protection from impact and splash.
Goggles and face shields should be used, also in combination, to prevent exposure of the eyes.
The goggles can be properly positioned over the mask with the textile elastic strap tightly secured (ECDC, 2020a).
Between clinical appointments, face and eye protections should be cleaned and disinfected (CDC, 2020d).

If you choose to wear a second pair of gloves

It had been reported that when double gloves were worn with PPE and the inner glove is the last item to be removed, there is a reduced possibility of contamination, compared to when single gloves were worn and removed first (Casanova et al., 2012).
The use of a double pair of gloves is suggested to avoid possible contact with contaminated surfaces, especially when removing the PPE. Double gloving can reduce the risk of viral contamination of dentist's hands also during PPE removal (Casanova et al., 2012).
The use of two pairs of gloves can limit the overall number of procedures performed without gloves (e.g. post treatment disinfection, removal of PPE).
However, the effectiveness of wearing two pairs of gloves in preventing disease transmission has not been demonstrated and can be associate to a reduction in haptic sensibility.

Conclusion

1. In office triage allows to exclude the contact with infected subjects and potential onset of symptoms.
2. Should be provided organization on the waiting list and the waiting room.
3. Should be performed hand washing and rubbing with hydroalcoholic solution.
4. Wear PPE in the follow order: first pair of gloves, gown, cap, masks, goggles or face shields, second pair of gloves if advice.

PHASE III: Treatment

L. Lardani, A. Barone, R. Izzetti, F. Graziani

Background

When performing dental procedures, a large amount of aerosol and spatter is produced due to the use of handpieces under irrigation. The risks related to aerosol production refer to two main factors: first, the large vaporization produced through the spray of handpieces, second the production of an infected aerosol incorporating saliva and blood (ADA, 2020). Aerosol production represents a bio-hazard not only for the dental professionals during the performance of their procedures, but extensively contributes to the risk of surface and environment contamination, representing a major issue in terms of direct contact transmission and cross-infection (ADA, 2020).

ACTION 8: PATIENT PREPARATION

WHO: Clinical staff (DENTAL ASSISTANT)

WHERE: Clinical area

WHAT: PATIENT PREPARATION

It is advised to provide patients with shoe covers on entering the clinical area. In particular, shoe covers can limit floor contamination on patient exiting the clinical area.
It is debated whether preoperative antimicrobial mouth rinse might reduce the viral load in the oral cavity (ADA, 2020). Thus, pre-procedural mouth rinse with 0.5-1% hydrogen peroxide, 0.2% povidone-iodine or Cetylpyridinium might reduce the load of Covid-19 in saliva (ADA, 2020). Rinsing is even more recommended when rubber dam is not employed.
Pediatric patients are a complex category of patient in this peculiar phase. In pediatric patients who have difficulties in performing a mouth rinse, the use of pre-procedural rinse should be substituted by the use of cotton rolls soaking (Ather et al., 2020).
Moreover, the parental presence in the dental operatory room is advocated to give emotional support and avoid the effect of the traumatic separation, especially in younger ages and in patients with special health-care needs. Further, the behavior may be affected by the young age of the child who can suffer by separation anxiety (Ather et al., 2020). Thus, parents need to be prepared as they would be patients to be treated.

ACTION 9: TREATMENT MANAGEMENT

WHO: Dental Professionals

WHERE: Clinical area

WHAT: TREATMENT MANAGEMENT

Dental practice involves the use of rotating handpieces, ultrasonic instruments, and air-water syringes.
Although it is recommended to limit aerosol generation, in some cases such a measure may appear unfeasible. We should therefore discriminate between dental treatments producing aerosol and non-aerosol generating procedures.
Examinations, orthodontic checks, and recall visit are low risk procedures also because a social distancing and infection control may suffice in preventing contagion. However, patient barriers and 4-hands technique appear effective additional measures to prevent contagion (Ather et al., 2020).
Ideally, aerosol protection should be avoided (i.e. prefer manual instrumentation) (Ather et al., 2020). However, when AGPs, such as restorative and endodontic treatments, oral surgery, and periodontology are performed, additional measures should be adopted such as the use of antiretraction handpieces to limit the risk of cross-infection (Ather et al., 2020, Meng et al., 2020).
An internal decontaminating liquid in dental unit system can be employed in cases handpieces are used.
Moreover, 4-hand technique, surgical aspiration, and use of rubber dam may minimize droplet spatter and aerosols. (Kohn et al., 2003; Meng et al., 2020; Samaranayake & Peiris, 2004).
If diagnostic imaging is needed, extraoral imaging such as panoramic radiography or cone-beam computed tomographic imaging is recommended as intraoral x-ray examination can stimulate saliva secretion and coughing, especially in patients with severe gag reflex (Ather et al., 2020) (Vandenberghe et al., 2010).
When intraoral imaging is needed, sensors should be covered with double barriers to prevent perforation and cross contamination (US EPA, 2020).

Conclusion

1. Adopt all the preventive measures to minimize aerosol production.
2. Prefer to use manually instrument if possible.
3. Use a rubber dam when is possible.
4. Prefer 4-hand technique.

PHASE IV: Post-treatment management

M.L. Biancarini, F. Graziani

ACTION 10: PATIENT EXITING

WHO: Non-clinical staff

WHERE: Non-clinical area

WHAT: PATIENT EXITING TREATMENT AREA AND DENTAL PRACTICE

Background

Similarly to the clinicians PPE, patient clothes can potentially be contaminated with droplets and aerosols produced during treatment (Dietz et al., 2020; Meng et al., 2020; Peng et al., 2020). Therefore, it is important to check that the patient leaves the practice reducing contacts with other patients and minimizing the time in the waiting room.

Suggestions

- It is recommended to invite the patient to wear again the surgical mask, to avoid contamination when leaving the practice.
- Have the patient remove shoe covers if worn.
- Retrieval of patients personal belongings.
- It is advisable to minimize the time spent by the patient, after treatment, in the waiting room.
- If necessary, have non-clinical staff accompany the patient to the practice exit.

Conclusion

1. Invite your patient to wear a surgical mask after treatment.
2. If necessary, have non-clinical staff assist the patient to leave the practice, preventing the clinical staff wearing contaminated PPE from leaving the clinical area.
3. After treatment, it is advisable to reduce the time spent by the patient in the waiting room.

ACTION 11: CLINICAL AREA SANITIZATION

WHO: Clinical staff (dental assistant)

WHERE: Clinical area

Instruments and materials management

Background

Cross-infection risk in dentistry relates to the transmission of various pathogenic organisms found in oral cavity, respiratory tract, and blood, including HCV, HBV, HIV, MERS-CoV and also SARS-CoV-2 (Peng et al., 2020; Sebastiani et al., 2017; J. Xu et al., 2020). SARS-CoV-2 recognizes multiple infection modalities which can occur in the dental setting, such as airborne transmission, direct contact with infected droplets, and indirect contact with contaminated instruments and surfaces, considering the presence of SARS-CoV-2 in saliva and blood (To et al., 2020).
For this reason, reusable instruments and materials should be disinfected and sterilized prior to re-usage, in order to avoid patient-to-patient and patient-to-clinician cross-infection (Sebastiani et al., 2017; WHO & PAHO, 2016).
Cleaning and decontaminating are the initial steps before sterilization and allow removal of visible soil and microbial load reduction using detergents and disinfectants. Before disinfecting the dental setting, reusable instruments should be soaked in a rigid container filled with detergent/disinfectant, and single-use materials should be disposed, in order to free surfaces from contaminated objects and subsequently proceed with surface disinfection (Coccolini et al., 2020; Sebastiani et al., 2017; WHO & PAHO, 2016)

Suggestions

It is advised to remove contaminated instruments and materials prior to the disinfection of clinical area surfaces.
Full PPE must be worn when removing the instruments and materials from surfaces (Izzetti et al., 2020).

- All potentially infected disposable materials should be disposed in infectious-risk health waste containers (Coccolini et al., 2020).
- Reusable materials should be removed from the dental unit, decontaminated with chloro-derivative solutions, washed, dried, and sterilized, according to manufacturer's instructions (Sebastiani et al., 2017).
- Electromedical equipment should be disinfected with chloro-derivative solution in a concentration ≥ 0.1% or 1000 ppm (parts per million), with contact time superior to 1 min, or 70% isopropyl alcohol (Coccolini et al., 2020; Meng et al., 2020; WHO & PAHO, 2016).
- Handpieces should be cleaned to remove debris, then heat-sterilized after each patient.

Prior to surface disinfection, reusable instruments should be removed from the dental unit and soaked in a decontamination container, while the sterilization phase should be performed after having managed the rest of the dental practice.

Conclusion

1. Manage contaminated instruments and materials by wearing the appropriate PPE, such as gloves and the rest of the equipment worn during treatment (Izzetti et al., 2020; Sebastiani et al., 2017).
2. Single-use materials should be disposed of properly, as well as disposable protections used for surfaces.
3. Reusable materials must be disinfected/sterilized to avoid patient-to-patient and patient-to-clinician cross-infection.

Ventilation

Background

The production of aerosol and droplets during routine dental procedures contributes to the generation of highly contaminated microbial aerosol, which could transmit SARS-CoV-2 (Dietz et al., 2020; Meng et al., 2020; Peng et al., 2020; J. Wei & Li, 2016). Ventilation rate and airflow patterns contribute directly to the airborne spread of COVID-19 (Y. Li et al., 2007; WHO, 2020d). Air change can be performed both by means of natural ventilation or mechanical ventilation (Dietz et al., 2020; Izzetti et al., 2020; Y. Li et al., 2007).

Suggestions

It is recommended to keep wearing all PPE before airing the rooms, as the air is potentially contaminated with aerosol derived from patient treatment.
It is important to minimize the possibility of contamination of the environment after treatment, wearing a clean pair of gloves for opening the window or starting ventilation systems (G. Ye et al., 2020).
If the responsible for clinical area management (clinician or assistant) wears a single pair of gloves for the treatment, contaminated gloves should be disposed after removing the instruments, and a clean pair of gloves should be worn for ventilation and surface disinfection. If a double pair of gloves is worn for treatment, simply remove the first pair and proceed with surface disinfection.
Please note that a double pair of gloves may be recommended both for the clinician and the assistant to limit potential contamination through infected surfaces.

For gloves removal use this sequence (CDC, https://www.cdc.gov/vhf/ebola/pdf/poster-how-to-remove-gloves.pdf):

1. Pinch the glove (with the other gloved hand) between the palm and wrist area and peel the glove away, pulling it inside out.
2. Hold the glove just doffed inside the hand with the glove.
3. Put the fingers of the bare hand inside the glove, at the top of the wrist, and peel the second glove away, turning it inside out and leaving the first glove inside the second.
4. Dispose of the gloves in a biohazard bin.
5. If bare hands touched the contaminated outer surface of the gloves, wash hands or use an alcohol-based hand sanitizer.

The following measures can be adopted:

- Air exchange is recommended before disinfection of clinical area instruments and surfaces, as aerosol in the air may contaminate the surfaces again and considering the necessity to keep all PPE worn.
- 10/15-minute air change strongly advised each patient, by natural ventilation opening the window or using ventilation systems (WHO, 2020d).
- Maintain a dry environment in the dental practice is recommended to limit virus diffusion.

Conclusions

1. The ventilation of the dental practice allows the movement of the aerosol present in the room, which could contaminate the surfaces or cause airborne transmission of SARS-CoV-2.
2. Air change is recommended after each patient before post-treatment surfaces management.
3. It is recommended to keep all PPE and wear a clean pair of gloves for opening the window or starting ventilation systems.

Surfaces disinfection

Background

Several potential transmission vectors can be recognized for the spread of COVID-19 through contaminated fomites (objects or materials that are likely to carry infectious diseases) and airborne particles. It has been hypothesized that environment plays a role in the spread of SARS-CoV-2, even in absence of direct contact with COVID-19 patients (Adams et al., 2016; Dietz et al., 2020; Tellier et al., 2019; van Doremalen et al., 2020).

During dental treatment, droplets, aerosol, and other biological substances (saliva, nasal fluid) containing the virus may contaminate the surfaces within the clinical area (Dietz et al., 2020; G. Ye et al., 2020). Furthermore, viral particles can be re-suspended from fomites due to turbulence in the indoor environment, such as foot fall, walking, and thermal plumes from warm human bodies, to resettle back onto fomites on other surfaces (Horve et al., 2020; Ong et al., 2020; J. Wei & Li, 2016).

Virus transfer from the surface to the individual (and vice versa) occurs through contact of the operator or patient with these contaminated surfaces (Stephens et al., 2019; Vandegrift et al., 2019; J. Wei & Li, 2016).

COVID-19 transmission has not been documented through deposition on fomites, but cleaning and disinfection of all surfaces should be performed, under the assumption that active SARS-CoV-2 may be transmitted by contact with these abiotic surfaces (Dietz et al., 2020; Ong et al., 2020; G. Ye et al., 2020).

In general, the disinfection of the dental setting should be considered a well-established routine for the prevention of cross-infections.

Suggestions

After dental treatment, careful disinfection of all surfaces that may be potentially contaminated needs to be performed, especially if the treatment has caused the production of large amounts of aerosol (Izzetti et al., 2020; J. Wei & Li, 2016).

Since the virus tends to remain in airborne particles, full PPE must be worn during the sanitizing procedure (Izzetti et al., 2020). The same gloves used in the ventilation phase can be kept on.

Disposable materials only (i.e., gloves, paper towel) should be used for cleaning.

- Disposable protections should be removed from the environmental surfaces.
- Clean, disinfect and dry all the surfaces of the room (such as handles, chairs and desks) using sodium hypochlorite 0.1% or 70% isopropyl alcohol or chloro-derivate solution (Dietz et al., 2020; Izzetti et al., 2020; Meng et al., 2020; Peng et al., 2020; G. Ye et al., 2020).
- Non-dedicated and non-disposable equipment (e.g., dental x-ray equipment, dental chair and light) should be disinfected according to manufacturer's instructions.
- Routine cleaning and disinfection procedures (e.g., using cleaners and water to pre-clean surfaces prior to applying an EPA-registered, hospital-grade disinfectant to frequently touched surfaces or objects for appropriate contact times as indicated on the product's label) are appropriate for SARS-CoV-2 in healthcare settings, including those patient-care areas in which aerosol-generating procedures are performed (G. Ye et al., 2020).

Conclusions

1. It is necessary to disinfect all surfaces in the dental practice, as they may be vectors of infection due to droplets or aerosols derived from patients.
2. It is recommended to wear the full PPE for surface disinfection, using the same clean gloves of the ventilation phase.
3. Disinfect all the surfaces of the room (such as handles, chairs and desks) with sodium hypochlorite 0.1% or 70% isopropyl alcohol or chloro-derivative solution.

ACTION 12: PPE REMOVAL

WHO: Clinical staff

WHERE: Clinical area

WHAT: PPE removal

Background

The incorrect PPE removal contributes to contamination of the operator's clothing and hands, and places all personnel at risk for infection (ECDC, 2020a; Ortega et al., 2015; Tomas et al., 2015; Verbeek et al., 2020; Zellmer, Van Hoof, & Safdar, 2015). Since it is advised to doff PPE wearing a clean pair of gloves, putting on double gloves during PPE donning can reduce the risk of viral contamination of the clinician's hands during PPE doffing, as contamination of skin and clothing frequently occurs during the removal of contaminated gloves (Casanova et al., 2012; Tomas et al., 2015).

It is necessary to remove all PPE before exiting the clinical area, to avoid contaminating external areas through contact with contaminated PPE (CDC, 2014; G. Ye et al., 2020).

A trained observer (colleague) should be present when a health care worker is removing PPE, to help him and immediately address any breaches in protocol (Cook et al., 2020; Ortega et al., 2015; WHO, 2015).

It has also been advised to use a checklist to document the correct sequence of steps to remove PPE (Cook et al., 2020; ECDC, 2020a; Ortega et al., 2015; Verbeek et al., 2020).

Suggestions

- Ensure that infectious waste containers are available for safe disposal of PPE (Ortega et al., 2015).
- Wear a clean pair of gloves for PPE removal, to avoid touching contaminated PPE with bare hands. Please note that the use of double-gloving reduces the possibility of self-contamination during PPE removal, so it is advisable to use double gloves at the time of PPE donning (Casanova et al., 2012).
- If possible, have an assistant help to avoid the contact with potentially contaminated equipment or surfaces during the doffing procedure.
- Doffing PPE in front of a mirror may facilitate the procedure.

Sequence of PPE doffing:
(CDC, 2020e; ECDC, 2020a)

Removing the gown and the contaminated gloves.

Contaminated gloves should be removed at the same time as the gown, before the removal of the other PPE (CDC, 2014; Coccolini et al., 2020; Verbeek et al., 2020; G. Ye et al., 2020).

When using a gown with back closure, an assistant should unbutton the backside of the gown, wearing gloves and a surgical mask. Assistant's gloves and mask need to be removed after opening the gown, subsequently performing hand hygiene using an hydro-alcoholic solution (ECDC, 2020a).

1. Unbuttoning the back closure by the assistant.
2. The clinician can now grab the back of the gown and pulling it away from the body, keeping the contaminated front part inside the gown.
3. While removing the gown, fold or roll it inside-out into a bundle.
4. As removing the gown, peel off the gloves at the same time, only touching the inside of the gloves and gown.
5. Disposing of the gown and the gloves in a biohazard bin.

If the clinician wore a single pair of gloves before starting PPE removal, after removal of gloves and gown a new pair of gloves should be worn to further continue the doffing procedure (possibly with the help of the assistant to avoid contact with surfaces). If the hands get contaminated during gloves removal, wash the hands or use an alcohol-based hand sanitizer before wearing the new pair of gloves (ECDC, 2020a).
If the clinician is wearing two pairs of gloves, simply remove the first pair with the gown and proceed removing PPE while wearing the remaining gloves.

Removing face shield.

1. Carefully remove face shield by grabbing the strap and pulling upwards and away from head. Do not touch the front of face shield (CDC, 2020e; G. Ye et al., 2020).
2. Place the face shield in a biohazard container for disinfection.

Removing the goggles.

1. Touching the front part of the googles, which can be contaminated, should be avoided (G. Ye et al., 2020).
2. Placing two fingers of each hand under the textile elastic strap in the back of the head, take the goggles off by widening the elastic band (ECDC, 2020a).
3. Place the goggles in a biohazard container for disinfection.

Removing the mask.

It is important to avoid touching the front of the mask during its removal, whether you wear a mask with elastic bands or a mask with laces (CDC, 2020e; Chin et al., 2020; ECDC, 2020a).

1. Carefully untie (or unhook from the ears) the mask.
2. Dispose of the mask in a biohazard bin.

If the clinician wore both FFP2/FFP3 and surgical mask, remove them together.

Removing surgical cap.

1. Remove surgical cap from behind the head, taking care to avoid contaminating your face.
2. Dispose of the surgical cap in a biohazard bin.

Removing the gloves.

The gloves should be removed in accordance with the procedure described above.
Wash hands or use an alcohol-based hand sanitizer immediately after removing all PPE (ECDC, 2020a).

Conclusions

1. PPE doffing is a risky procedure, which can expose the clinician to self-contamination due to contaminated PPE.
2. It is important to follow a check list for the sequence of the removal, preferably with the help of an assistant or in front of a mirror.
3. It is imperative to remove PPE wearing a clean pair of gloves, without ever meeting contaminated PPE with your bare hands and always performing hand disinfection at the end of the procedure.

EFP suggestions for the management of a dental clinic during the Covid-19 pandemic

01. PATIENT TRIAGE

Strongly suggested Suggested Unknown evidence

⚠ This document is not a **guideline** but rather a **suggestion** document based on the limited available literature and observations from clinicians.

Please make sure to follow the legal requirements specified in your country by the government and relevant institutions. The suggestions provided in this document should in no way interfere with recommendations provided by local and national health-care authorities.

Current evidence related to dental management during the SARS-CoV-2 pandemic is observational and prospectively designed interventions, to form the basis for evidence-based recommendations, are missing.

These infographics provide only a snapshot with preliminary information that may change and mature over time with increasing knowledge, evidence from prospective studies, and changes in the pandemic. Therefore, comments may be addressed to European Project Committee of the EFP that may be considered for future updates.

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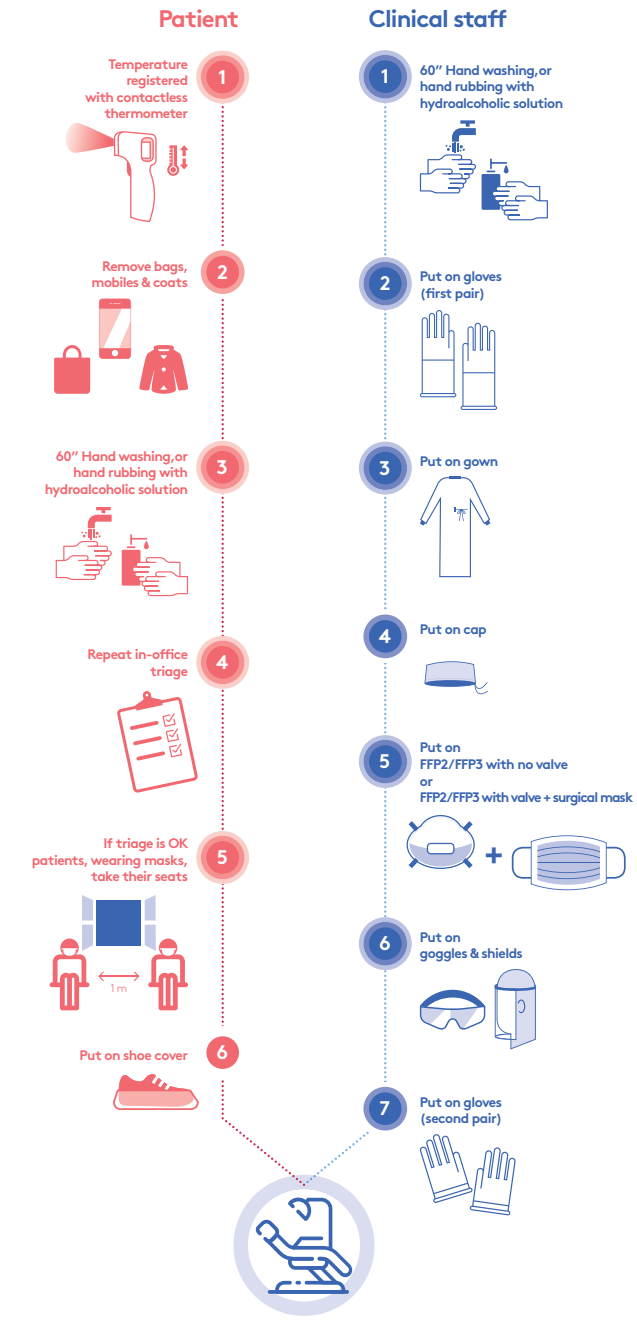
EFP suggestions for the management of a dental clinic during the Covid-19 pandemic

02. PATIENT ARRIVAL AT THE DENTAL OFFICE
Prior to dental treatment



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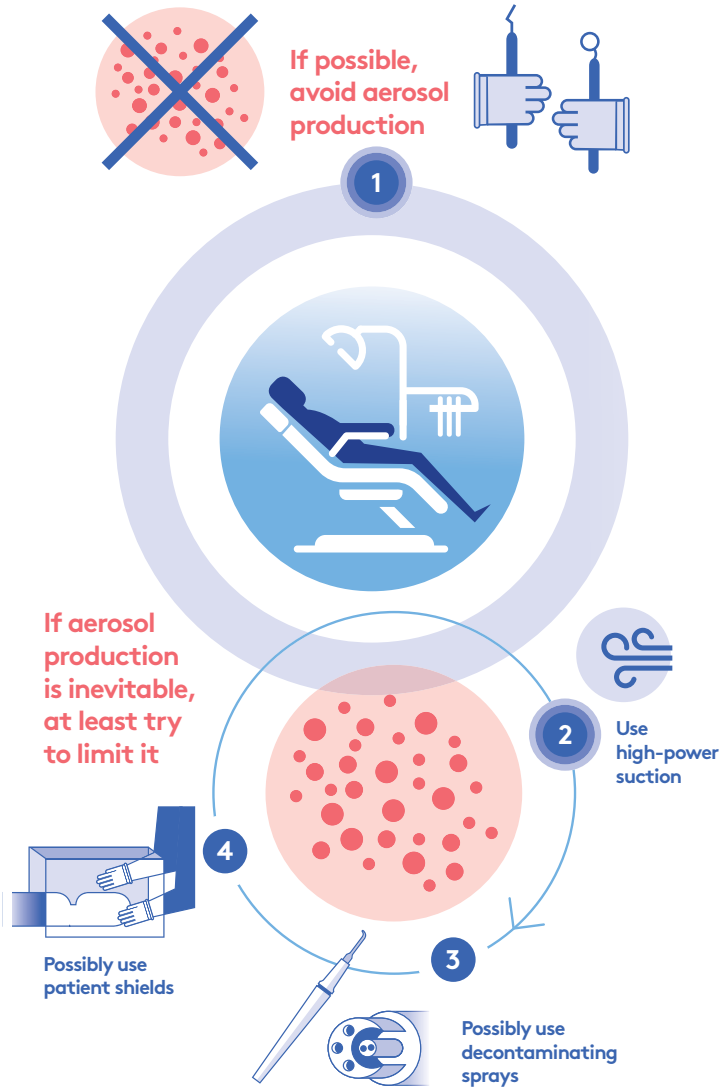
03. PATIENT TREATMENT



Strongly suggested | Suggested | Unknown evidence

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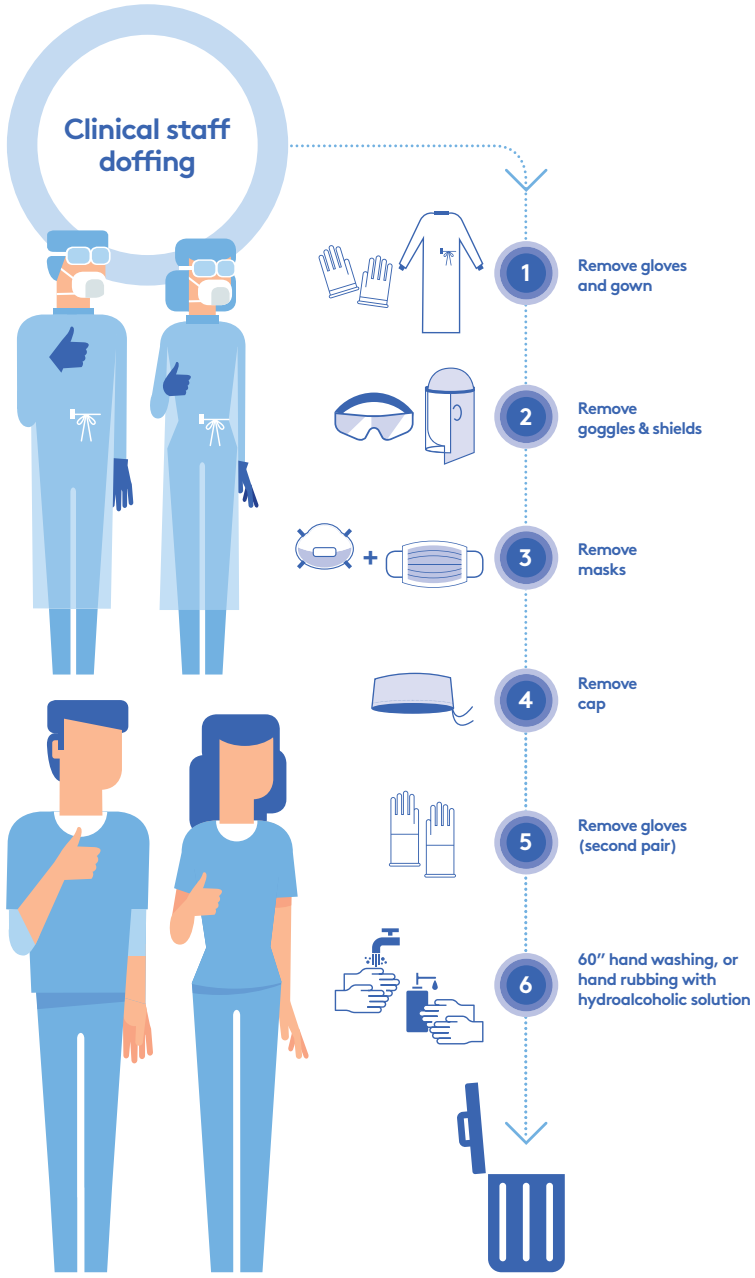
04. END OF THE TREATMENT



Strongly suggested Suggested Unknown evidence

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Phone triage questionnaire

1. **Do you, to your knowledge, currently have Covid-19?**
2. **Have you previously been infected by the SARS-CoV-2 virus? If yes, have you been declared healed from Covid-19 clinically or have tested negative with a nasopharyngeal swab?**
3. **Do you currently have any of the following symptoms: fever, cough, respiratory difficulty, conjunctivitis, diarrhea, flu, lack of smell and taste?**
4. **In the last month have your had any of the following symptoms: fever, cough, respiratory difficulty, conjunctivitis, diarrhea, flu, lack of smell and taste?**
5. **Did you have any contact with SARS-CoV-2–infected patients in the last month?**
6. **Did you have any contact with subjects placed in quarantine, either self-imposed or organised by the health authorities, in the last month?**
7. **Did you have any contact with subjects coming from highly epidemic regions in the last month?**
8. **Are you a health-care worker? If yes, what is your job?**

Go back to the infographic

Strongly suggested **Suggested** **Unknown evidence**

This document is not a **guideline** but rather a **suggestion** document based on the limited available literature and observations from clinicians.

Please make sure to follow the legal requirements specified in your country by the government and relevant institutions. The suggestions provided in this document should in no way interfere with recommendations provided by local and national health-care authorities.

Current evidence related to dental management during the SARS-CoV-2 pandemic is observational and prospectively designed interventions, to form the basis for evidence-based recommendations, are missing.

These infographics provide only a snapshot with preliminary information that may change and mature over time with increasing knowledge, evidence from prospective studies, and changes in the pandemic. Therefore, comments may be addressed to European Project Committee of the EFP that may be considered for future updates.

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Useful links

ADA. (2020). Interim Guidance for Management of Emergency and Urgent Dental Care. https://www.ada.org/~/media/CPS/Files/COVID/ADA_Int_Guidance_Mgmt_Emerg-Urg_Dental_COVID19?utm_source=adaorg&utm_medium=VanityURL&utm_content=interimguidance-flowcharts&utm_campaign=covid-19

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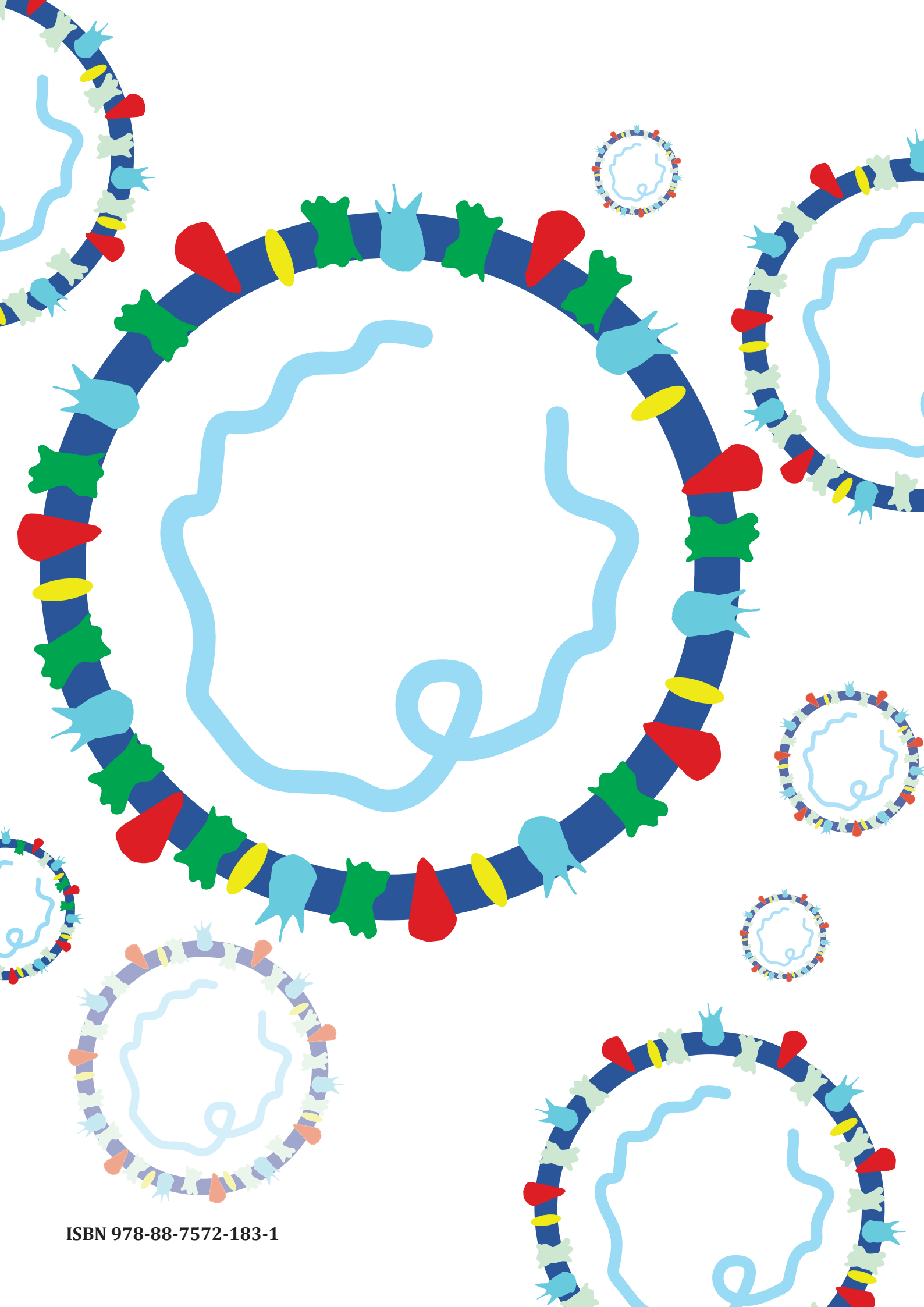
WHO & PAHO. (2016). Decontamination and Reprocessing of Medical Devices for Health-care Facilities. https://www.who.int/infection-prevention/publications/decontamination/en/

https://www.edizionimartina.com/DownloadFile.asp?folder=/edizionimartina/dettaglitesti/filmati/650/650_GrazianiSarsCov2Bibliografia.pdf&Tipologia=1



ISBN 978-88-7572-183-1